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ÖNSÖZ

Herhangi bir bilgiyi belleğe sağlıklı olarak yerleştirebilmek için en bilinen ve en çok güvenilen yöntem tekrar yapmaktır. Kısa süreli bellekteki bir bilginin uzun süreli belleğe kaydolup geri çağırımının gerçekleşebilmesi için sistemli tekrar yapmak şarttır. Kitabımızdaki konular bu amaç doğrultusunda soru tiplerine ve özelliklerine göre gruplandırılmıştır. Konuya ait tüm özellikler tek tek ele alınmıştır. Ölçülmek istenen bilgi ile ilgili sorular, farklı açılardan sorularak bilginin pekiştirilmesi sağlanmıştır. Böylece öğrenciler bölümdeki soruların çözülmesi için tüm konunun bitmesini beklemeden öğrenilen soru tiplerinin çözümüne başlayabileceklerdir.

Kitabımızı referans alacak değerli meslektaşlarımız da konunun bitimini beklemeden, konunun anlatılan kısmından öğrencilerine ödev verebileceklerdir. Kitaptaki tüm sorular bilgilerin tümevarım yöntemi ile öğrenilmesi için basit soru tiplerinden karmaşık soru tiplerine adım adım geçiş yapılacak şekilde düzenlenmiştir. Bölüm sonu testlerinde üst düzey analiz gerektiren sorulara yer verilmiştir.

Değerli öğretmenlerimize ve sevgili öğrencilerimize yararlı olması dileğiyle...

Uğur PUZA

FOREWORD

The must confident and well known way to put any kind of information into the memory safely is to repeat. For calling back the recorded information into the long term memory that is actually in the short term memory, systematic repetition is essential. The subjects in our book are classified according to the question types and attributes in parallel to this purpose. All the attributes regarding that topic have been considered one by one respectively.

The questions that are related to the information to be tested, are asked from various points of views to consolidate the information. As a result the students have the chance to start solving questions of all question types directly without waiting for the completion of the chapter for solving the questions. Our colleagues have also chance to give their students homework from the completed part without waiting for the full completion of the related chapter. All questions in the book are organized with the induction method that start with the simpler question types and improve into more complex question types. In the chapter final tests there are also question types that require higher level analysis skills. With our best wishes that this work will be useful to both our teachers and dear students...

Uğur PUZA

İÇİNDEKİLER

POLİNOMLAR

POLYNOMIALS

POLİNOMLAR

TANIM | Defination

$n \in N$

$a_n, a_{n-1}, a_{n-2}, \dots, a_0 \in R$

$P(x) = a_n x^n + a_{n-1}x^{n-1} + \dots + a_1 x + a_0$

şeklindeki R'den R'ye tanımlı fonksiyonlara polinom denir.
every defined function from R to R is called polynomial

$a_n x^n, a_{n-1}x^{n-1}, \dots, a_1 x, a_0$
polinomun terimleri
terminology of polynomial

$a_n, a_{n-1}, \dots, a_1, a_0$
polinomun katsayıları
coeficient of polynomial

a_n : polinomun başkatsayısı
leading coeficient of polynomial

a_0 : polinomun sabit terimi
fixed term of polynomial

n : polinomun derecesi (x'in en büyük kuvveti)
Degree of polynomial (greatest exponent of x)

$(d[P(x)] = derP(x) = n)$

x'in doğal sayı kuvetlerinden meydana gelen fonksiyona polinom denir.
A function which results from natural exponents of x is called polynomial.

1. Aşağıda verilen fonksiyonlardan hangileri polinomdur?
Which of the following functions are polynomial?

a) $f(x) = 2$

b) $f(x) = 3x^2 - 5x + 7$

c) $f(x) = 0$

d) $f(x) = \sqrt{2}$

e) $f(x) = \sqrt{x}$

f) $f(x) = \sqrt{3}x^2$

g) $f(x) = \frac{1}{x^2}$

h) $f(x) = 3x^2 - 5x$

i) $f(x) = x^3 + \sin x$

j) $f(x) = 4x^3 - 7x^2 + 3x + 1$

k) $f(x) = x^2 - \log x$

a, b, c, d, f, h, j

2. Aşağıda verilen polinomların dereceleri nedir?
What are the degrees of the given polynomials?

a) $P(x) = 2x^2 - 5x + 7$ — 2

b) $P(x) = x + 7x^2 - 5x^3$ — 3

c) $P(x) = 7x - 1$ — 1

d) $P(x) = 9$ — 0

e) $P(x) = 0$ — tanımsız *(undefined)*

ÖZELLİK | Property 1

Her polinom bir fonksiyon olduğundan polinomlar, fonksiyonun tüm özelliklerini sağlar.

Bir polinomun bir reel sayıdaki değeri fonksiyonda olduğu gibi değer yerine yazılarak bulunur.

As each polynomial is a function, all the polynomials provide the same properties of functions.

In real numbers the value of a polynomial can be found by putting the given value in the place, the same way it is done in factors.

1. $P(x) = 3x + 1$

$\Rightarrow P(2) = ?$

7

2. $P(x) = x^2 - 3x$

$\Rightarrow P(3) = ?$

0

3. $P(x) = 2x^2 - 3x$

$\Rightarrow 2P(1) = ?$

−2

4. $P(x) = 3x + k$

$P(1) = 7$

$\Rightarrow k = ?$

4

5. $P(x) = x^2 - 2x + k$

$P(1) = 10$

$\Rightarrow k = ?$

11

6. $P(x + 4) = 3x^2 - 2x$

$\Rightarrow P(6) = ?$

8

7. $P(2x + 1) = 3x^2 - 2$

$\Rightarrow P(5) = ?$

10

8. $P(x^2) = 2x^4 - 2x^2$

$\Rightarrow P(3) = ?$

12

ÖZELLİK | Property 2

Bir fonksiyonun polinom olması için x'in kuvveti doğal sayı (N) olmalıdır.

To define a function as a polynomial, exponents of x should be natural number.

$N = \{0, 1, 2, 3, \ldots\ldots\}$

1. $n \in N$

$P(x) = 3x^{n-2} + 4x^{\frac{5}{n}} + 7$

P(x) polinom ise n kaçtır?

If P(x) is a polynomial what is the value of n?

5

2. $n \in N$

$P(x) = 2x^{\frac{12}{n}} + 5$

P(x) polinom ise n kaç olabilir?

If P(x) is a polynomial what is the value of n?

1, 2, 3, 4, 6, 12

3. $n \in N$

$P(x) = 4x^{n-3} + 2x^{7-n} + 9$

P(x) polinom ise n kaç olabilir?

If P(x) is a polynomial what is the value of n?

3, 4, 5, 6, 7

4. $n \in N$

$P(x) = 4 \cdot x^{\left(\frac{3n+24}{n}\right)}$

P(x) polinom ise n kaç farklı değer alır?

If P(x) a is polynomial, how many different values could 'n' take?

8

POLİNOMLAR

ÖZELLİK | Property 3

İki Polinomun Eşitliği
The Equality of Two Polynomials

İki polinomun eşit olabilmesi için aynı dereceli terimlerin katsayıları eşit olmalıdır.

For two polynomials to be equal to each other their factors of similar degree terms should be equal.

1. $P(x) = (5a - 1)x^2 + (b + 1)x$
$Q(x) = 9x^2 + 4x$
$P(x) = Q(x)$
$\Rightarrow a + b = ?$ **5**

2. $P(x) = (a + 2)x^2 + 4x - c$
$Q(x) = 3x^2 - (b + 1)x + 3$
$P(x) = Q(x)$
$\Rightarrow a \cdot b \cdot c = ?$ **15**

3. $(a - 1)x^2 + 3x - 2 = (b - 3)x^3 + x^2 + 3x - c$
$\Rightarrow a + b + c = ?$ **7**

4. $(x + 2)(x - 3) = ax^2 + bx + c$
$\Rightarrow a + b + c = ?$ **– 6**

5. $(x - 1)(2x + 1) = ax^2 + bx + c$
$\Rightarrow a + b + c = ?$ **0**

6. $(a - 1)x^2 + 3x + 1 = x^2 + (b - 1)x + 1$
$\Rightarrow a + 2b = ?$ **10**

7. $\dfrac{5x+4}{x^2+x-2} = \dfrac{A}{x-1} + \dfrac{B}{x+2}$
$\Rightarrow A \cdot B = ?$ **6**

8. $\dfrac{3x+3}{x^2-9} = \dfrac{A}{x-3} + \dfrac{B}{x+3}$
$\Rightarrow A \cdot B = ?$ **2**

9. $\dfrac{3x+7}{x^2+5x+6} = \dfrac{A}{x+2} + \dfrac{B}{x+3}$
$\Rightarrow A \cdot B = ?$ **2**

10. $P(x) = (a - 1)x^3 + 2x^2 + c - 1$
$Q(x) = (b + 1)x^2 + 6$
$P(x) = Q(x)$
$\Rightarrow a \cdot b \cdot c = ?$ **7**

11. $x(x - 1) + 2x = ax^2 + bx + c$
$\Rightarrow a \cdot b \cdot c = ?$ **0**

12. $x(x^2 + 2) = (a - 1)x^3 + (b + 1)x^2 + cx$
$\Rightarrow a + b + c = ?$ **3**

13. $3x - 3 = a(x + 1) + b(x - 2)$
$\Rightarrow a \cdot b = ?$ **2**

14. $5x - 2 = a(x - 1) + b(x + 2)$
$\Rightarrow 2a + b = ?$ **9**

15. $P(x) = x^2 - 2$
$Q(x) = ax^2 + bx + c$
$P(x + 1) = Q(x)$
$\Rightarrow a + b + c = ?$ **2**

ÖZELLİK | Property 4

İki Polinomun Toplamı ve Farkı
Addition and Subtraction of Polynomials

Polinomlarda toplama ve çıkarma işlemi yapılırken eşit dereceli terimlerin katsayıları toplanır veya çıkarılır.

In addition and subtraction operations of polynomials equal degree terms are added or subtracted.

$P(x) = 2x^3 - 5x^2 + 7x + 10$
$Q(x) = x^3 + 4x^2 + 5$

$P(x) + Q(x) = 3x^3 - x^2 + 7x + 15$
$P(x) - Q(x) = x^3 - 9x^2 + 7x + 5$

İki Polinomun Çarpımı
Multiplication of Polynomials

İki polinom çarpılırken çarpma işleminin toplama işlemi üzerine dağılma özelliği kullanılır.

In multiplication of polynomials the distirbution over addition is used.

$P(x) = x^2 - x$
$Q(x) = 2x - 3$

$P(x) \cdot Q(x) = (x^2 - x) \cdot (2x - 3)$
$= 2x^3 - 3x^2 - 2x^2 + 3x$
$= 2x^3 - 5x^2 + 3x$

1. $P(x) = 2x^3 + 2x - 1$
$Q(x) = x^2 + 6x + 3$
$\Rightarrow P(x) + Q(x) = ?$

$2x^3 + x^2 + 8x + 2$

2. $P(x) = x^2 - 3x$
$Q(x) = 2x^2 + 4$
$3P(x) - Q(x) = ?$

$x^2 - 9x - 4$

3. $P(x) = 2x^2 - 3$
$Q(x) = x^3 + x^2$
$\Rightarrow 2P(x) + 3Q(x) = ?$

$3x^3 + 7x^2 - 6$

4. $P(x) = 2x^2 - 3x$
$Q(x) = x^2$
$\Rightarrow Q(x) - 2P(x) = ?$

$-3x^2 + 6x$

5. $P(x) = x^3 - x^4 + x$
$Q(x) = -x^3 - x^2 + 2$
$\Rightarrow P(x) - Q(x) = ?$

$-x^4 + 2x^3 + x^2 + x - 2$

6. $P(x) = x^2$
$Q(x) = x - 1$
$\Rightarrow P(x) \cdot Q(x) = ?$

$x^3 - x^2$

7. $P(x) = x^2 - 1$
$Q(x) = x + 1$
$\Rightarrow P(x) \cdot Q(x) = ?$

$x^3 + x^2 - x - 1$

8. $P(x) = (x^3 + x + 1)$
$Q(x) = x + 3$
$\Rightarrow P(x) \cdot Q(x) = ?$

$x^4 + 3x^3 + x^2 + 4x + 3$

9. $P(x) = 3x^3 - 2x^2 + 5$
$Q(x) = 2x - 3$
$\Rightarrow P(x) \cdot Q(x) = ?$

$6x^4 - 13x^3 + 6x^2 + 10x - 15$

POLİNOMLAR

ÖZELLİK | Property 5

P(x) ve Q(x) polinom

If P(x) and Q(x) are polynomials

$d[P(x)] = m \qquad d[Q(x)] = n$

- $d[P(x) \cdot Q(x)] = m + n$
- $\dfrac{P(x)}{Q(x)}$ polinom ise *(if* $\dfrac{P(x)}{Q(x)}$ *is polynomial)*

  $d\left[\dfrac{P(x)}{Q(x)}\right] = m - n$
- $d[P(x) \mp Q(x)] = \max\{m, n\}$

  $(m \neq n)$
- $k \in R$

  $d[k \cdot P(x)] = m$

  $d[P(kx)] = m$
- $k \in R$

  $d[P(x^k)] = k \cdot m$

  $d[P^k(x)] = k \cdot m$

1. $P(x) = 4x^6 - 3x^2$

$\Rightarrow d[P(x)] = ?$ $\boxed{6}$

2. $P(x) = (x^2 - 1)^3$

$\Rightarrow d[P(x)] = ?$ $\boxed{6}$

3. $P(x) = x^{n+3} - 2x + 3$

$d[P(x)] = 6$

$\Rightarrow n = ?$ $\boxed{3}$

4. $P(x) = (x^2 - 1)^3 \cdot x^3$

$\Rightarrow d[P(x)] = ?$ $\boxed{9}$

5. $P(x) = (x^2 + 1)^4(x - 1)^3$

$\Rightarrow d[P(x)] = ?$ $\boxed{11}$

6. $d[P(x)] = 4$

$\Rightarrow d[P(x^2)] = ?$ $\boxed{8}$

7. $d[P(x)] = 6$

$d[Q(x)] = 4$

$\Rightarrow d[P(x) \cdot Q(x)] = ?$ $\boxed{10}$

8. $d[P(x)] = 8$

$d[Q(x)] = 3$

$\Rightarrow d\left[\dfrac{P(x)}{Q(x)}\right] = ?$ $\boxed{5}$

9. $d[P^2(x) \cdot Q(x)] = 8$

$d\left[\dfrac{P(x)}{Q(x)}\right] = 1$

$\Rightarrow d[P(x)] = ?$ $\boxed{3}$

10. $d[P^3(x) \cdot Q^2(x)] = 16$

$d\left[\dfrac{P(x)}{Q(x)}\right] = 2$

$\Rightarrow d[P(x + 2)] = ?$ $\boxed{4}$

11. $d[P(x) \cdot Q(3x)] = 7$

$d[P(x) \cdot Q(x^2)] = 9$

$\Rightarrow d[P(3x)] = ?$ $\boxed{5}$

ÖZELLİK | Property 6

P(x) polinomu verilen eşitliğin derecesine uygun şekilde seçilir.
1. dereceden ise $P(x) = ax + b$
2. dereceden ise $P(x) = ax^2 + bx + c$ olarak alınır.

Equality of the given polynomial P(x) is chosen properly according to the given equation.
If it's linear polynomial then $P(x) = ax + b$
If it's quadratic polynomial then $P(x) = ax^2 + bx + c$

1. $2P(x) + P(-x) = x + 9$
$\Rightarrow P(x) = ?$ — $x + 3$

2. $P(x + 1) + P(x - 1) = 4x + 6$
$\Rightarrow P(x) = ?$ — $2x + 3$

3. $P(x + 2) + P(x - 2) = 2x + 6$
$\Rightarrow P(2) = ?$ — 5

4. $P(x) + P(2x) = 6x + 8$
$\Rightarrow P(x) = ?$ — $2x + 4$

5. $P(x) + P(x + 1) = 6x + 1$
$\Rightarrow P(1) = ?$ — 2

6. P(x) pozitif katsayılı polinom
P(x) positive coefficient polynomial
$P(x) \cdot P(2x) = 2x^2 + 6x + 4$
$\Rightarrow P(x) = ?$ — $x + 2$

7. P(x) pozitif katsayılı polinom
P(x) positive coefficient polynomial
$P(x) \cdot P(-x) = 1 - 4x^2$
$\Rightarrow P(2) = ?$ — 5

8. $P(x - 2) - 2P(x) = -x^2 - 6x + 5$
$\Rightarrow P(x) = ?$ — $x^2 + 2x - 5$

ÖZELLİK | Property 7

Denklemlerde bilinmeyen ifade var ise P(x) polinomunun yanındaki çarpan sıfıra eşitlenerek bilinmeyen sayı bulunur. Sonra ifade sadeleştirilerek aranan ifade elde edilir.

If there is an unknown term in equations it can be determined by equalizing the factor next to the P(x) polynomial to zero . Then it can be simplified.

1. $(x - 1) \cdot P(x) = x^2 - kx - 5$
$\Rightarrow k = ?$ — -4

2. $(x - 2) \cdot P(x) = ax^2 - 3x + 2$
$\Rightarrow a = ?$ — 1

3. $(x + 1) \cdot P(x) = x^3 - 2a$
$\Rightarrow a = ?$ — $-\frac{1}{2}$

4. $(x + 2) \cdot P(x) = x^2 - 2kx$
$\Rightarrow P(3) = ?$ — 3

5. $(x - 3) \cdot P(x) = x^2 - 5x + k$
$\Rightarrow P(1) = ?$ — -1

6. $(x + 2) \cdot P(x) = x^2 + 5x + k$
$\Rightarrow P(-2) = ?$ — 1

7. $(x + 1) \cdot P(x) = x^2 + 3x + k$
$\Rightarrow P(-1) = ?$ — 1

POLİNOMLAR

ÖZELLİK | Property 8

Katsayılar toplamını elde etmek için katsayılar toplamı istenen polinomda x yerine "1" yazılır.

Sabit terimi elde etmek için de x yerine "0" yazılır.

The sum of coefficients in a given polynomial can be found by putting "1" in the place of x.

The constant expression can be found by putting "0" in the place of x.

1. $P(x) = 6x^3 - 2x^2 + 1$

P(x) polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of P(x)? 5

2. $P(x + 1) = x^2 - 2x + 4$

P(x) polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of P(x)? 4

3. $P(x - 2) = 3x^3 - 4$

P(x) polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of P(x)? 77

4. $P(x) = ax^2 - 6x + 1$

P(x) polinomunun katsayılar toplamı 10 ise a kaçtır?

If the sum of coefficients of P(x) polynomials is 10 then what is the value of "a"? 15

5. $P(x - 1) = x^3 + 2x + 1$

P(x + 1) polinomunun katsayılar toplamı kaçtır?

What is the sum of the coefficients of P(x + 1) polynomial ? 34

6. $P(x + 3) = x^2 + 1$

P(x – 2) polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of P(x – 2) polynomial? 17

7. $P(x) = 6x^2 - 2$

P(x) polinomunun sabit terimi kaçtır?

What is the constant term of P(x) polynomial? – 2

8. $P(x) = x^3 - 2x$

P(x) polinomunun sabit terimi kaçtır?

What is the constant term of P(x) polynomial? 0

9. $P(x - 2) = x^2 + 3x + 1$

P(x) polinomunun sabit terimi kaçtır?

What is the constant term of P(x) polynomial? 11

10. $P(x + 3) = 3x - 4$

P(x + 1) polinomunun sabit terimi kaçtır?

What is the constant term of P(x + 1) polynomial? –10

ÖZELLİK | Property 9

$$\begin{array}{l|l} P(x) & Q(x) \\ \hline - & B(x) \\ \hline K(x) & \end{array} \qquad d[Q(x)] \le d[P(x)]$$

P(x) : Bölünen *(Devided)*

Q(x) : Bölen *(Divisor)*

B(x) : Bölüm *(Division)*

K(x) : Kalan *(Remainder)*

- $P(x) = Q(x) \cdot B(x) + K(x)$
- $d[K(x)] < d[Q(x)]$

1.

$$\begin{array}{l|l} x^5 - 2x^3 + x^2 - 2 & x^2 - 2 \\ \hline - & B(x) \\ \hline K(x) & \end{array}$$

$\Rightarrow B(x) = ?$

$\boxed{x^3 + 1}$

2.

$$\begin{array}{l|l} x^4 + x^3 + 2x^2 + x + 1 & x^2 + 1 \\ \hline - & B(x) \\ \hline K(x) & \end{array}$$

$\Rightarrow B(x) = ?$

$\boxed{x^2 + x + 1}$

3.

$$\begin{array}{l|l} x^4 + x^3 - x^2 - 2x & x + 1 \\ \hline - & B(x) \\ \hline K(x) & \end{array}$$

$\Rightarrow B(x) = ?$

$\boxed{x^3 - x - 1}$

4.

$$\begin{array}{l|l} x^5 + x^3 - x^2 - x & x^3 - 1 \\ \hline - & B(x) \\ \hline & \end{array}$$

$\Rightarrow B(x) = ?$

$\boxed{x^2 + 1}$

5.

$$\begin{array}{l|l} 2x^3 + x^2 + x & x^2 - x - 1 \\ \hline - & \\ \hline K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

$\boxed{6x + 3}$

6.

$$\begin{array}{l|l} x^3 - 5x^2 + 4x + 7 & x^2 - 3 \\ \hline - & \\ \hline K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

$\boxed{7x - 8}$

7.

$$\begin{array}{l|l} 2x^4 - 3x^2 + x & x^2 + x \\ \hline - & B(x) \\ \hline K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

$\boxed{2x}$

8.

$$\begin{array}{l|l} x^3 + x^2 + x & x^2 - x - 1 \\ \hline - & B(x) \\ \hline K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

$\boxed{4x + 2}$

9.

$$\begin{array}{l|l} x^3 - 4x^2 + mx + n & x^2 - 2x + 5 \\ \hline - & B(x) \\ \hline 0 & \end{array}$$

$\Rightarrow m \cdot n = ?$

$\boxed{-90}$

POLİNOMLAR

ÖZELLİK | Property 10

$$\begin{array}{r|l} P(x) & x-a \\ \hline - & B(x) \\ \hline K & \end{array}$$

Bir polinom, birinci dereceden bir polinoma bölünüyorsa kalan, sabit sayıdır.

If a polynomial is divided by a linear polynomial; the remainder is a constant number.

$$P(x) = (x-a)\cdot B(x) + K$$

$$x = a \Rightarrow P(a) = K$$

1. $\begin{array}{r|l} x^3 - 2x + 1 & x+1 \\ \hline - & \\ \hline K(x) & \end{array}$ $\Rightarrow K(x) = ?$

$\boxed{2}$

2. $\begin{array}{r|l} x^4 - 3x + 1 & x-2 \\ \hline - & \\ \hline K(x) & \end{array}$ $\Rightarrow K(x) = ?$

$\boxed{11}$

3. $\begin{array}{r|l} P(x) & x-1 \\ \hline - & \\ \hline K & \end{array}$ $P(x-1) = x^2 - 3x + 1$

$\Rightarrow K = ?$

$\boxed{-1}$

4. $\begin{array}{r|l} P(x+1) & x-1 \\ \hline - & \\ \hline K & \end{array}$ $P(x-2) = x^3 - 2x + 1$

$\Rightarrow K = ?$

$\boxed{57}$

5. $\begin{array}{r|l} P(x+1) & x+2 \\ \hline - & \\ \hline K & \end{array}$ $P(x-1) = x^2 - ax + 4$

$\Rightarrow K = ?$

$\boxed{4}$

6. $\begin{array}{r|l} P(x) & x-1 \\ \hline - & \\ \hline 2 & \end{array}$ $P(x) = x^2 + ax - 2$

$\Rightarrow a = ?$

$\boxed{3}$

7. $\begin{array}{r|l} P(x) & x-3 \\ \hline - & \\ \hline 6 & \end{array}$ $P(x) = ax^2 + 3x - 2$

$\Rightarrow a = ?$

$\boxed{-\frac{1}{9}}$

8. $\begin{array}{r|l} P(x-1) & x-2 \\ \hline - & \\ \hline 8 & \end{array}$ $P(x+1) = x^2 - ax + 6 + b$

$\Rightarrow b = ?$

$\boxed{2}$

9. $\begin{array}{r|l} P(x) & x-1 \\ \hline - & \\ \hline 3 & \end{array}$ $\begin{array}{r|l} Q(x) & x+2 \\ \hline - & \\ \hline 2 & \end{array}$

$P(x+1) + 2Q(x-2) = a(x-2) + 4$

$\Rightarrow a = ?$

$\boxed{-\frac{3}{2}}$

10. $\begin{array}{r|l} P(x) & x \\ \hline - & \\ \hline 4 & \end{array}$ $\begin{array}{r|l} Q(x) & x+1 \\ \hline - & \\ \hline 2 & \end{array}$

$P(x+2) + Q(x+1) = x^2 - 2ax - 4$

$\Rightarrow a = ?$

$\boxed{\frac{3}{2}}$

11. $\begin{array}{r|l} P(x+1) & x-1 \\ \hline - & \\ \hline 2 & \end{array}$ $\begin{array}{r|l} Q(x) & x-2 \\ \hline - & \\ \hline 3 & \end{array}$

$P(x) + Q(x) = 2x + a$

$\Rightarrow a = ?$

$\boxed{1}$

ÖZELLİK | Property 11

Örnek | Example

$$\begin{array}{l|l} P(x) = 2x^3 - 4x^2 + 5x - 7 & x^2 + 1 \\ \hline - \qquad\qquad\qquad\qquad & B(x) \\ \hline \qquad K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

Çözüm | Answer

Klasik bölme işlemi yapmadan kalan bulunabilir.
Without using a classic division method remainder can be found.

$x^2 + 1 = 0 \Rightarrow x^2 = -1$

Polinomda x^2 yerine -1 yazılır.
In polynomial -1 is insted of x^2.

$$\begin{aligned} P(x) &= 2x^3 - 4x^2 + 5x - 7 \\ &= 2x^2 \cdot x - 4x^2 + 5x - 7 \\ &= 2(-1) \cdot x - 4(-1) + 5x - 7 \\ &= -2x + 4 + 5x - 7 \\ &= 3x - 3 \end{aligned}$$

$\Rightarrow K(x) = 3x - 3$

1.

$$\begin{array}{l|l} x^4 - 2x^2 + 4 & x^2 - 1 \\ \hline - \qquad\qquad & \\ \hline \qquad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{3}$

2.

$$\begin{array}{l|l} 2x^6 - 2x^3 + 6 & x^3 - 2 \\ \hline - \qquad\qquad & \\ \hline \qquad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{10}$

3.

$$\begin{array}{l|l} x^{12} - 4x^8 + 6x^4 & x^4 - 1 \\ \hline - \qquad\qquad & \\ \hline \qquad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{3}$

4.

$$\begin{array}{l|l} 2x^6 - 3x^3 + a & x^3 + 2 \\ \hline - \qquad\qquad & \\ \hline \qquad 0 & \end{array}$$

$\Rightarrow a = ?$

$\boxed{-14}$

5.

$$\begin{array}{l|l} 4x^3 - 2x^2 + 1 & x^2 - 1 \\ \hline - \qquad\qquad & \\ \hline \qquad K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

$\boxed{4x - 1}$

6.

$$\begin{array}{l|l} x^5 - 2x^3 + x^2 - 3 & x^2 - 2 \\ \hline - \qquad\qquad & \\ \hline \qquad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{-1}$

7.

$$\begin{array}{l|l} x^4 - 2x^3 + ax & x^3 - 1 \\ \hline - \qquad\qquad & \\ \hline \qquad 3x - 2 & \end{array}$$

$\Rightarrow a = ?$

$\boxed{2}$

8.

$$\begin{array}{l|l} x^5 - 3x^3 + x^2 + a & x^3 + 2 \\ \hline - \qquad\qquad & \\ \hline \qquad -x^2 + 7 & \end{array}$$

$\Rightarrow a = ?$

$\boxed{1}$

9.

$$\begin{array}{l|l} x^3 + ax^2 + b + 2 & x^2 - x \\ \hline - \qquad\qquad & \\ \hline \qquad 3x + 3 & \end{array}$$

$\Rightarrow a + b = ?$

$\boxed{3}$

10.

$$\begin{array}{l|l} x^2 + ax + b + 5 & x^2 - 3x + 2 \\ \hline - \qquad\qquad & \\ \hline \qquad 0 & \end{array}$$

$\Rightarrow a = ?$

$\boxed{-3}$

ÖZELLİK | Property 12

Örnek | Example

$P(x) \,|\, x-1$, $-$, 3 $\qquad$ $P(x) \,|\, x+1$, $-$, 7 $\qquad$ $P(x) \,|\, x^2-1$, $-$, $K(x)$

$\Rightarrow K(x) = ?$

Çözüm | Answer

$P(x) \,|\, x-1$, $-$, 3 $\quad \Rightarrow P(1) = 3$

$P(x) \,|\, x+1$, $-$, 7 $\quad \Rightarrow P(-1) = 7$

$P(x) \,|\, x^2-1$, $-$, $K(x)$ $\quad \Rightarrow P(x) = (x^2-1)\cdot B(x) + K(x)$

Kalan 1. dereceden polinom
Remainder is a linear polynomial

$K(x) = ax + b$

$P(x) = (x^2-1)\cdot B(x) + ax + b$

$x = 1 \qquad P(1) = a + b = 3$

$x = -1 \qquad P(-1) = -a + b = 7$

$a = -2 \qquad b = 5$

$K(x) = -2x + 5$

1. $P(x) \,|\, x-2$, $-$, 3 $\qquad$ $P(x) \,|\, x-1$, $-$, 2 $\qquad$ $P(x) \,|\, x^2-3x+2$, $-$, $K(x)$

$\Rightarrow K(x) = ?$ $\qquad \boxed{x+1}$

2. $P(x) \,|\, x-1$, $-$, -1 $\qquad$ $P(x) \,|\, x+2$, $-$, 2 $\qquad$ $P(x) \,|\, x^2+x-2$, $-$, $K(x)$

$\Rightarrow K(x) = ?$ $\qquad \boxed{-x}$

3. $P(x) \,|\, x+2$, $-$, 4 $\qquad$ $P(x) \,|\, x+1$, $-$, 2 $\qquad$ $P(x) \,|\, x^2+3x+2$, $-$, $K(x)$

$\Rightarrow K(x) = ?$ $\qquad \boxed{-2x}$

4. $P(x) \,|\, x-2$, $-$, 0 $\qquad$ $P(x) \,|\, x+2$, $-$, -2 $\qquad$ $P(x) \,|\, x^2-4$, $-$, $K(x)$

$\Rightarrow K(x) = ?$ $\qquad \boxed{\frac{x}{2}-1}$

5. $x^2+ax+b+3 \,|\, (x-1)(x+2)$, $-$, 0

$\Rightarrow a + b = ?$ $\qquad \boxed{-4}$

6. $x^3+ax^2-bx+2 \,|\, (x-2)(x+3)$, $-$, 2

$\Rightarrow a + b = ?$ $\qquad \boxed{7}$

7. $x^3+ax^2+3x+b \,|\, (x-2)(x-1)$, $-$, 0

$\Rightarrow a = ?$ $\qquad \boxed{\frac{-10}{3}}$

8. $x^3+ax^2+bx+2 \,|\, (x-2)(x+1)$, $-$, 0

$\Rightarrow a + b = ?$ $\qquad \boxed{-3}$

ÖZELLİK | Property 13

Örnek | Example

$$\begin{array}{r|l} P(x) & x^2-4 \\ \hline -\quad 3x-5 & \end{array} \qquad \begin{array}{r|l} P(x) & x-2 \\ \hline -\quad K & \end{array} \qquad \Rightarrow K = ?$$

Çözüm | Answer

$$\begin{array}{r|l} P(x) & x^2-4 \\ \hline -\quad 3x-5 & B_1(x) \end{array} \Rightarrow P(x) = (x^2-4)\cdot B_1(x) + 3x - 5$$

$P(2) = 3 \cdot 2 - 5 = 1$ ..... (I)

$$\begin{array}{r|l} P(x) & x-2 \\ \hline -\quad K & B_2(x) \end{array} \Rightarrow P(x) = (x-2)\cdot B_2(x) + K$$

$P(2) = K$ ..... (II)

(I), (II) $\Rightarrow K = 1$

1.

$$\begin{array}{r|l} P(x) & x^3-8 \\ \hline -\quad x^2+x-2 & \end{array} \qquad \begin{array}{r|l} P(x) & x-2 \\ \hline -\quad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{4}$

2.

$$\begin{array}{r|l} P(x) & x^2-3x+2 \\ \hline -\quad x+4 & \end{array} \qquad \begin{array}{r|l} P(x) & x-1 \\ \hline -\quad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{5}$

3.

$$\begin{array}{r|l} P(x) & (x-4)^2 \\ \hline -\quad 6-8x & \end{array} \qquad \begin{array}{r|l} P(x) & x-4 \\ \hline -\quad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{-26}$

4.

$$\begin{array}{r|l} P(x) & x^2+5x \\ \hline -\quad 7x-15 & \end{array} \qquad \begin{array}{r|l} P(x) & x+5 \\ \hline -\quad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{-50}$

5.

$$\begin{array}{r|l} P(x) & x^2+6x \\ \hline -\quad x-5 & \end{array} \qquad \begin{array}{r|l} P(x) & x+6 \\ \hline -\quad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{-11}$

6.

$$\begin{array}{r|l} P(x) & x^3-27 \\ \hline -\quad x^2-5x+6 & \end{array} \qquad \begin{array}{r|l} P(x) & x^2+3x+9 \\ \hline -\quad K & \end{array}$$

$\Rightarrow K = ?$

$\boxed{-8x-3}$

7.

$$\begin{array}{r|l} P(x) & x^2-x-1 \\ \hline -\quad 2x-1 & \end{array} \qquad \begin{array}{r|l} P^2(x) & x^2-x-1 \\ \hline -\quad K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

$\boxed{5}$

ÖZELLİK | Property 14

Horner Yöntemi | Horner Method

2.	1.
	3.

Bir P(x) polinomunu Horner yöntemi ile "x – a"ya bölmek için tablo yapılır.

By using Horner method, a table above can be done to divide a P(x) polynomial to "x – a"

- P(x) polinomunun katsayıları x'in azalan kuvvetlerine göre, 1. bölgeye yazılır.
  Factors of P(x) polynomial is written in 1st region according to the decreasing exponents of x.
- $x - a = 0 \Rightarrow x = a$
  değeri 2. bölgeye yazılır.
  (value of "a" is written in 2nd region)
- Başkatsayı bulunduğu sütundan 3. bölgeye indirilir.
  The leading coeficient is put down to 3th region.
- a değeri başkatsayı ile çarpılarak bir sonraki katsayı ile toplanır. Bu işlem tüm katsayılar için uygulanır.
  The value of 'a' is multiplied by the leading coeficient, and it is added to the next coefficient. This opperation is applied to all coeficients.
- En son elde edilecek değer kalanı, diğerleri ise bölüm polinomununun katsayılarını verir.
  The final numbers gives us the remainder value and the others give the division of polynomial factors.

Örnek | Example

$P(x) = x^3 - 2x^2 + x + 4$

polinomunun x – 3 ile bölümünden elde edilen bölüm ve kalanı bulunuz.

Find the remainder and division of $P(x) = x^3 - 2x^2 + x + 4$ polynomial divided by x-3.

Çözüm | Answer

3	1	−2	1	4
		3 · 1	3 · 1	3 · 4
	1	1	4	16

Bölüm polinomunun katsayıları (*Factors of polynomial division*) — Kalan (*Remainder*)

Bölüm Polinomu: $1 \cdot x^2 + 1 \cdot x + 4 \cdot x^0 = x^2 + x + 4$
Polynomial division

Kalan Polinom: 16
Polynomial remainder

1. $2x^3 + 3x^2 - 5x + 7 \;|\; x - 1$ → B(x)

K(x)

⇒ B(x) = ?
⇒ K(x) = ?

$2x^2 + 5x$
7

2. $x^3 + x + 1 \;|\; x + 1$ → B(x)

K(x)

⇒ B(x) = ?
⇒ K(x) = ?

$x^2 - x + 2$
−1

3. $2x^4 - x^3 + x^2 + x + 1 \;|\; x - 2$ → B(x)

K(x)

⇒ B(x) = ?
⇒ K(x) = ?

$2x^3 + 3x^2 + 7x + 15$
31

4. $2x^3 - x^2 + 3 \;|\; x + 3$ → B(x)

K(x)

⇒ B(x) = ?
⇒ K(x) = ?

$2x^2 - 7x + 21$
−60

5. $2x^3 - 3x^2 + 7x + 3 \;\big|\; x - 2$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$2x^2 + x + 9$
21

6. $3x^4 - 4x^3 - 2x^2 + 5x + 5 \;\big|\; x - 1$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$3x^3 - x^2 - 3x + 2$
7

7. $2x^3 - 11x^2 + 6 \;\big|\; x - 3$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$2x^2 - 5x - 15$
-39

8. $6x^4 - 6x^2 + 2 \;\big|\; x - 2$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$6x^3 + 12x^2 + 18x + 36$
74

9. $2x^4 + x^3 + 4x + 1 \;\big|\; x - 2$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$2x^3 + 5x^2 + 10x + 24$
49

10. $-x^3 + 3x^2 - 9 \;\big|\; (x - 1)^2$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$-x + 1$
$3x - 10$

11. $x^3 - x^2 + x + 1 \;\big|\; (x - 2)^2$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$x + 3$
$9x - 11$

12. $-4x^4 + 4x - 5 \;\big|\; (x - 1) \cdot (x + 2)$

$-$ $\qquad$ $B(x)$

$K(x)$

$\Rightarrow B(x) = ?$

$\Rightarrow K(x) = ?$

$-4x^2 + 4x - 12$
$24x - 29$

1. $Q(x) = 2x^2 - 3x - 4$
$\Rightarrow 2 \cdot Q(2) = ?$

A) -8 B) -4 C) -2 D) 0 E) 2

2. $P(x - 3) = x^4 - 3x^2 - 2x + 1$
$\Rightarrow P(-1) = ?$

A) -2 B) 1 C) 3 D) 8 E) 11

3. $P(x, y) = x^4y^2 - x^2y^3 + y^4 + x + 1$
$\Rightarrow P(1, -1) = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

4. $P(x) = x^2 - 4x + a$
$P(2) = 1$
$\Rightarrow a = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

5. $P(x^2 - 5) = 2x^4 - 3x^2 - 6$
$\Rightarrow P(1) = ?$

A) 36 B) 38 C) 42 D) 48 E) 60

6. $P(x) = a \cdot x^2 - x + 2$
$\Rightarrow P(2) - P(-2) = ?$

A) -4 B) -2 C) 0 D) 2 E) 4

7. $P(x^3) = 2x^9 - 3x^6 - 2x^3 + 1$
$\Rightarrow P(2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

8. $P(x) = x^2 + 2x + 1$
$\Rightarrow P(x - 1) = ?$

A) x^2 B) $x^2 - 2x$ C) $x^2 + 2x$ D) $x^2 + 2x + 1$ E) $x^2 - 2x + 1$

9. $P(x-1) = x^2 + x + 1$
$\Rightarrow P(x) = ?$

A) $x^2 - 1$ B) $x^2 - x$ C) $x^2 + 3x + 1$ D) $x^2 + 3x + 3$ E) $x^2 - x - 1$

10. $P(x+2) = x^2 - 2x - 2$
$\Rightarrow P(x) = ?$

A) $x^2 - 8x$ B) $x^2 - 4x$ C) $x^2 + 8x + 13$ D) $x^2 - 4x + 6$ E) $x^2 - 6x + 6$

11. $P(x-2) = x^2 + x - 6$
$\Rightarrow P(x-1) = ?$

A) $x^2 - 4x + 3$ B) $x^2 + 5x$ C) $x^2 + 3x - 4$ D) $x^2 + 2x$ E) $x^2 - 3x + 1$

12. $P(x) = 3x^2 - 4x + 1$
$Q(x) = x^2 + 7$
$\Rightarrow P(x) + 2 \cdot Q(x) = ?$

A) $5x^2 - 4x + 8$ B) $5x^2 - 8x + 3$ C) $4x^2 - 4x + 8$ D) $5x^2 - 4x + 15$ E) $4x^2 - 3x + 8$

13. $P(x) = x^2 + 1$
$Q(x) = 3x - 4$
$\Rightarrow P(x) \cdot Q(x) = ?$

A) $3x^3 - 4$ B) $3x^3 - 4x^2 + 3x - 4$ C) $4x^2 + 3x$ D) $3x^3 - 4x^2 - 4$ E) $3x^3 - 4x^2 + 3x$

14. $\left.\begin{array}{l} P(x) = x^2 + 2x - 1 \\ Q(x) = 2x^2 - x + 1 \end{array}\right\} \Rightarrow 2P(x) - Q(x) = ?$

A) $4x^2 - 2x + 3$ B) $3x^2 - 5x$ C) $x^2 - 2x + 6$ D) $4x^2 - 3$ E) $5x - 3$

15. $P(x) = (-3x^5 - 4x^2 + 2x - 1) \cdot (x^4 - 3x^3 + 2x)$
$P(x) = a \cdot x^9 + b \cdot x^8 + c \cdot x^7 + d \cdot x^6 + \ldots$
$\Rightarrow d = ?$

A) -10 B) -8 C) -6 D) -4 E) -2

16. $P(x) = (x^5 - 2x^4 + x^2 - 1) \cdot (3x^3 - 2x + 1)$
$P(x) = a \cdot x^8 + b \cdot x^7 + c \cdot x^6 + \ldots$
$\Rightarrow b = ?$

A) -6 B) -4 C) -2 D) -1 E) 0

1. $\forall x \in R$

$P(x) = 2x^2 - (a + 2) \cdot x + 4$

$Q(x) = (b - 2) \cdot x^2 + x + c - 1$

$P(x) = Q(x)$

$\Rightarrow a + b + c = ?$

A) 4 B) 5 C) 6 D) 7 E) 9

2. $\forall x \in R$

$P(x) = (a - 2) \cdot x^3 + (b - 1) \cdot x^2 + a - 4$

$Q(x) = 6x^3 + (c + 1) \cdot x + d + b + c$

$P(x) = Q(x)$

$\Rightarrow d = ?$

A) -2 B) -1 C) 2 D) 4 E) 6

3. $\forall x \in R$

$(a - 1) \cdot x^3 + (b + 1) \cdot x^2 + c - 2 = 0$

$\Rightarrow a + b + c = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

4. $\forall x \in R$

$(2a - b + 3c) \cdot x^2 + (3b + c) \cdot x + b - 1 = 0$

$\Rightarrow a + b + c = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

5. $\forall x \in R$

$(x - 2) \cdot (x - a) = x^2 + bx - 6$

$\Rightarrow b = ?$

A) -1 B) 0 C) 1 D) 2 E) 3

6. $\forall x \in R$

$(x - 5) \cdot (x + m) = x^2 + (n - 1) \cdot x - 35$

$\Rightarrow m \cdot n = ?$

A) -21 B) -7 C) 0 D) 7 E) 21

7. $\forall x \in R$

$3x - 2 = m \cdot (x - 1) + n \cdot (x + 1)$

$\Rightarrow m + n = ?$

A) -1 B) 0 C) 1 D) 2 E) 3

8. $\forall x \in R$

$ax^3 + bx^2 + cx + d = (x^2 - 1) \cdot (mx + n) - x$

$\Rightarrow b + d = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

9. $\forall x \in R$

$x^2 + 7x + 12 = (x + a)^2 + (x + a)$

$\Rightarrow a = ?$

A) -4 B) 1 C) 2 D) 3 E) 4

10. $\forall x \in R$

$P(x) = ax^2 + bx + c$

$Q(x + 2) = (x - 1)^2$

$P(x) = Q(x)$

$\Rightarrow a + b + c = ?$

A) 1 B) 2 C) 3 D) 4 E) 6

11. $\forall x \in R$

$P(x) = x^2 - 2x - 8$

$Q(x) = x^2 + ax + b$

$P(x + 1) = Q(x)$

$\Rightarrow a + b = ?$

A) -10 B) -9 C) -8 D) -6 E) -4

12. $\forall x \in R$

$P(x - 1) = x^2 + bx + c$

$P(x + 1) = x^2 - 2x - 3$

$\Rightarrow b \cdot c = ?$

A) -30 B) -20 C) -15 D) -12 E) 0

13. $\forall x \in R$

$$\frac{5x+1}{x^2+x-2} = \frac{A}{x-1} + \frac{B}{x+2}$$

$\Rightarrow A \cdot B = ?$

A) -2 B) 0 C) 2 D) 4 E) 6

14. $\forall x \in R$

$$\frac{-x-9}{x^2-9} = \frac{A}{x-3} + \frac{B}{x+3}$$

$\Rightarrow \frac{A}{B} = ?$

A) -4 B) -2 C) 0 D) 2 E) 4

15. $\forall x \in R$

$$\frac{2x+8}{x^2-4} = \frac{A}{x-2} + \frac{B}{x+2}$$

$\Rightarrow A \cdot B = ?$

A) -3 B) -1 C) 0 D) 1 E) 3

16. $\forall x \in R$

$$\frac{3x+2}{x^3+x} = \frac{Ax+B}{x^2+1} + \frac{C}{x}$$

$\Rightarrow A \cdot B \cdot C = ?$

A) -12 B) -6 C) 6 D) 12 E) 18

1. $P(x) = 2x^7 - 4x^2 + 3x + 1$
$\Rightarrow d[P(x)] = ?$

A) 5 B) 7 C) 8 D) 9 E) 10

2. $P(x) = x^{2n+1} + x^5 - 3$
$d[P(x)] = 11$
$\Rightarrow n = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

3. $P(x, y) = x^6 + x^4y^3 + x^3y + y^3 - 1$
$\Rightarrow d[P(x, y)] = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

4. $P(x) = (x^4 - 2x)^3$
$\Rightarrow d[P(x)] = ?$

A) 12 B) 10 C) 7 D) 6 E) 4

5. $P(x) = (x^3 - 3x^2 + 1)^4 \cdot (x^2 + 1)^5$
$\Rightarrow d[P(x)] = ?$

A) 22 B) 20 C) 18 D) 15 E) 12

6. $P(x) = (x^2 + 1)^2 \cdot (x^3)$
$\Rightarrow d[P(x^2)] = ?$

A) 7 B) 10 C) 12 D) 14 E) 21

7. $P(x^3) = x^{15} + x^{12} + x^9$
$\Rightarrow d[P(x^2)] = ?$

A) 15 B) 12 C) 10 D) 8 E) 6

8. $P(x) = (2x^3 - x^2 + 1)^4 \cdot (2x^2 - x)^n$
$d[P(x)] = 20$
$\Rightarrow n = ?$

A) 4 B) 6 C) 8 D) 10 E) 12

9. $d[P(x)] = 16$

$d[Q(x)] = 4$

$\Rightarrow d\left[\dfrac{P(3x)}{Q(x)}\right] = ?$

A) 4 B) 6 C) 8 D) 12 E) 16

10. $d[P(x) \cdot Q(x)] = 7$

$d\left[\dfrac{P(x)}{Q(x)}\right] = 5$

$\Rightarrow d[P(x) - Q(x)] = ?$

A) 2 B) 4 C) 6 D) 7 E) 8

11. $d[P^2(x) \cdot Q(x)] = 11$

$d\left[\dfrac{P(x)}{Q(x)}\right] = 4$

$\Rightarrow d[P(x)] = ?$

A) 3 B) 5 C) 7 D) 8 E) 9

12. $d[P(x) \cdot Q^2(x)] = 13$

$d\left[\dfrac{P^2(x)}{Q(x)}\right] = 6$

$\Rightarrow d[Q(x)] = ?$

A) 8 B) 6 C) 5 D) 4 E) 3

13. $P(x) = -3x^{n-4} + 2x^{\frac{16}{n}-1}$

$\Rightarrow \max d[P(x)] = ?$

A) 4 B) 6 C) 8 D) 12 E) 16

14. $d[P(x) \cdot Q(x^2)] = 7$

$d\left[\dfrac{Q(x)}{P(x)}\right] = 2$

$\Rightarrow d[P(x) \cdot Q(x)] = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

15. $P(x) = x^{\frac{n^2-4}{n}} + 2x^{-n}$

$\Rightarrow \max d[P(x)] = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

16. $P(x) = 4x^{3-n} + 2x^{n+4}$

$\Rightarrow \min d[P(x)] = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

1. $P(x) = 3x^4 - 2x^3 + 2x - 5$

P(x) polinomunun katsayılar toplamı kaçtır?

What is the sum of the coefficients of P(x) polynomial?

A) – 5 B) – 3 C) – 2 D) 2 E) 3

2. $P(x) = (x^2 - 2x + 4)^2$

P(x) polinomunun sabit terimi kaçtır?

What is the constant term of P(x) polynomial?

A) 1 B) 4 C) 9 D) 16 E) 64

3. $P(x) = (x^2 - 4x + 5)^2$

P(x) polinomunun katsayılar toplamı kaçtır?

What is the sum of the coefficients of P(x) polynomial?

A) 0 B) 4 C) 9 D) 16 E) 25

4. $P(x) = x^2 - 3x + a$

P(x) polinomunun sabit terimi 2

If the constant term of P(x) is 2

$\Rightarrow P(2) = ?$

A) 2 B) 0 C) – 2 D) – 4 E) – 6

5. $P(x) = ax^3 + 3x^2 + 2x - 4$

P(x) polinomunun katsayılar toplamı 4

The sum of coefficients of P(x) is 4

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

6. $P(x - 2) = x^2 - 2x - 4$

P(x) polinomunun sabit terimi kaçtır?

What is the constant term of P(x) polynomial?

A) – 6 B) – 4 C) – 2 D) 0 E) 2

7. $P(x + 1) = x^2 + x - 2$

P(x – 1) polinomunun sabit terimi kaçtır?

What is the constant term of P(x – 1) polynomial?

A) – 8 B) – 6 C) – 4 D) – 2 E) 0

8. $P(x + 1) = x^3 + ax^2 + x$

P(x + 2) polinomunun katsayılar toplamı 0

The sum of coefficients of P(x + 2) is 0

$\Rightarrow a = ?$

A) $-\frac{5}{2}$ B) – 2 C) – 1 D) 0 E) $\frac{5}{2}$

9. $P(x) = 3x^3 - 3x^2 + x - 2$

$P(x + 1)$ polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of $P(x + 1)$ polynomial?

A) -40 B) -38 C) -36 D) 8 E) 12

10. $P(x) = x^3 + 2x^2 + ax - 4$

$P(2x - 1)$ polinomunun sabit terimi 3

The constant term of $P(2x - 1)$ is 3

$\Rightarrow a = ?$

A) -8 B) -6 C) -4 D) -2 E) 0

11. $P(2x - 3) = x^2 - 2x + 3$

$P(2x - 1)$ polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of $P(2x - 1)$ polynomial?

A) 7 B) 6 C) 4 D) 3 E) 1

12. $P(ax + 1) = 5ax - 2$

$P(ax - 1)$ polinomunun sabit terimi kaçtır?

What is the constant term of $P(ax - 1)$ polynomial?

A) -12 B) -10 C) -8 D) -6 E) -5

13. $P(x - 3) = Q(x - 4)$

$P(x)$ polinomunun katsayılar toplamı 4 ise $Q(x)$ polinomunun sabit terimi kaçtır?

If the sum of the coefficients of $P(x)$ is 4. What is the constant term of $Q(x)$ polynomial?

A) 0 B) 1 C) 2 D) 3 E) 4

14. $P(x - 1) + Q(x - 2) = x^2 - 2m + 3$

$P(x)$ polinomunun katsayılar toplamı 4, $Q(x)$ polinomunun sabit terimi 2

The sum of coefficients of $P(x)$ polynomial is 4, the constant term of $Q(x)$ polynomial is 2

$\Rightarrow m = ?$

A) $\frac{1}{2}$ B) 1 C) 2 D) $\frac{5}{2}$ E) 3

15. $P(2x + 1) = x \cdot Q(2x + 2) - 2x + 4$

$P(x)$ polinomunun sabit terimi 4 ise, $Q(x)$ polinomunun katsayılar toplamı kaçtır?

If the constant term of $P(x)$ is 4, what is the sum of coefficients of $Q(x)$?

A) 1 B) 2 C) 3 D) 4 E) 6

16. $P(x^2 + 1) = Q(x - 1) \cdot (x^2 - 1)$

$P(x + 5)$ polinomunun sabit terimi 3 ise, $Q(x)$ polinomunun katsayılar toplamı kaçtır?

If the constant term of $P(x + 5)$ is 3, what is the sum of coefficients of $Q(x)$?

A) 0 B) 1 C) 2 D) 3 E) 4

1. $P(x) = (m - 1) \cdot x^2 + (n - 2) \cdot x + m + 2n$

P(x) polinomu sabit bir polinom belirttiğine göre, P(10) değeri kaçtır?

As the polynomial of P(x) is a constant polynomial, what is the value of P(10)?

A) 10 B) 8 C) 7 D) 5 E) 4

2. $P(x) = (a - 2) \cdot x^3 + (b + 4) \cdot x^2 + a + b$

P(x) polinomu sabit bir polinom belirttiğine göre, P(14) değeri kaçtır?

As the polynomial of P(x) is a constant polinomial, what is the value of P(14)?

A) – 6 B) – 2 C) 0 D) 2 E) 6

3. $P(x - 3) = (a - 1) \cdot x^2 + (b + 1) \cdot x + a \cdot b$

P(x) polinomu sabit bir polinom belirttiğine göre, P(4) değeri kaçtır?

As the polynomial of P(x) is a constant polynomial, what is the value of P(4)?

A) – 2 B) – 1 C) 0 D) 1 E) 2

4. $P(x + 1) = (a + b - 3) \cdot x^2 + (-b + 2) \cdot x + a \cdot b$

P(x) polinomu sabit bir polinom belirttiğine göre, P(a – b) değeri kaçtır?

As the polynomial of P(x) is a constant polynomial, what is the value of P(a – b)?

A) $\frac{1}{5}$ B) $\frac{1}{2}$ C) $\frac{5}{4}$ D) 2 E) 3

5. $P(2x - 1) = x^3 - 6x^2 - 5$

P(x + 1) polinomunun sabit terimi kaçtır?

What is the constant term of P(x + 1) polynomial?

A) – 11 B) – 10 C) – 6 D) – 4 E) – 2

6. $P(x - 3) = x^3 - 5x^2 - 2$

P(x + 1) polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of P(x + 1) polynomial?

A) – 250 B) – 125 C) – 2 D) 2 E) 125

7. $P(2x - 1) = x^2 + ax + 6 - a$

P(x) polinomunun katsayılar toplamı kaçtır?

What is the sum of coefficients of P(x) polynomial?

A) 8 B) 7 C) 6 D) 5 E) 4

8. $P(2x + 3) = x^3 - 2ax + 1$

P(x – 2) polinomunun katsayılar toplamı 5 olduğuna göre, a kaçtır?

As the sum of coefficients of P(x – 2) polynomial is 5, what is a?

A) 5 B) 4 C) 3 D) 2 E) 1

9. $P(x) = (a + 1) \cdot x^2 - (a - 3) \cdot x + a - 4$

P(x) polinomunun katsayılar toplamı 4 olduğuna göre, a kaçtır?

As the sum of coefficients of P(x) polynomial is 4, what is a?

A) – 4 B) – 2 C) 2 D) 4 E) 8

10. $P(x - 1) = x^2 - 2x + a + 1$

P(x) polinomunun sabit terimi 3 olduğuna göre, a değeri kaçtır?

As the constant term of P(x) polynomial is 3, what is a?

A) –1 B) 0 C) 1 D) 2 E) 3

11. $P(2x + 1) = x^2 + ax + a$

P(x) polinomunun katsayılar toplamı 4 ise P(x – 3) polinomunun sabit terimi kaçtır?

If the sum coefficients of P(x) polynomial is 4, what is the constant term of P(x – 3) polynomial?

A) – 4 B) – 2 C) 0 D) 4 E) 11

12. $P(x) = x^2 + 4x - a$

P(x) polinomunun sabit terimi 1 olduğuna göre, P(x – 2) polinomunun sabit terimi kaçtır?

As the constant term of P(x) polynomial is 1, what is the constant term of P(x – 2) polynomial?

A) – 5 B) – 4 C) – 3 D) – 2 E) – 1

13. $P(3x - 2) = x^4 - 2x^2 - 1$

P(x + 1) polinomunun sabit terimi kaçtır?

What is the constants term of P(x + 1) polynomial?

A) – 3 B) – 2 C) – 1 D) 0 E) 1

14. $P(x) = x^2 - (a + 1) \cdot x - 3$

P(x) polinomunun katsayılar toplamı –4 olduğuna göre, P(x + 1) polinomunun katsayılar toplamı kaçtır?

As the sum of coefficients of P(x) polynomial is –4, what is the sum of coefficient of P(x + 1) polynomial?

A) – 7 B) – 6 C) – 5 D) – 4 E) – 3

15. $P(x) = x^3 - ax^2 + 2ax + 1$

P(x) polinomunun katsayılar toplamı 3 olduğuna göre, P(2x + 1) polinomunun katsayılar toplamı kaçtır?

As the sum of coefficients of P(x) polynomial is 3, what is the sum of coefficients of P(2x + 1) polynomial?

A) 25 B) 18 C) 11 D) 8 E) 7

16. $P(x) = (2a - 1) \cdot x^2 + a \cdot x$

$Q(x) = ax^2 + (4a + 1)x - 2$

P(x) polinomunun katsayılar toplamı 11 olduğuna göre, Q(x) polinomunun katsayılar toplamı kaçtır?

As the sum of coefficients of P(x) polynomial is 11, what is the sum of coefficients of Q(x) polynomial?

A) 19 B) 17 C) 15 D) 14 E) 13

1. $\dfrac{2x^5+x^3-4x^2-2}{x^3-2}=?$

A) $2x+1$ B) $2x^2+1$ C) x^2+1 D) $2x^2+2$ E) $2x^2+x+2$

2. $x^6+3x^3 \,|\, x^2-1$ $\Rightarrow B(x)=?$

$-$ $B(x)$

A) x^4+x^2+3x+1 B) x^4-3x+1 C) x^4-x^2+1 D) x^4+x^2+1 E) x^4+x^2-3x-1

3. $3x^3+4x^2+1 \,|\, x+1$ $\Rightarrow B(x)=?$

$-$ $B(x)$

A) $3x^2$ B) $3x^2+1$ C) $3x^2+x$ D) $3x^2+x-1$ E) $3x^2-2x+1$

4. $x^3-2x^2+3x-3 \,|\, x-1$ $\Rightarrow K=?$

$-$ K

A) -4 B) -3 C) -2 D) -1 E) 2

5. $x^3+ax^2-2x+1+a \,|\, x-1$ $\Rightarrow a=?$

$-$ 4

A) -4 B) -2 C) 2 D) 4 E) 6

6. $P(x-2)=2x^3+x^2-4$

$P(x) \,|\, x+1$ $\Rightarrow K=?$

$-$ K

A) -5 B) -3 C) -1 D) 1 E) 2

7. $P(3x-2)=4x^3-2x^2+x$

$P(x) \,|\, x-4$ $\Rightarrow K=?$

$-$ K

A) 28 B) 26 C) 18 D) 16 E) 8

8. $P(x)=x^2-3x+1$

$P(x+1) \,|\, x-2$ $\Rightarrow K=?$

$-$ K

A) -2 B) -1 C) 1 D) 3 E) 4

9. $P(x-2) = x^3 - 4x^2 + x + 1$

$P(x+1) \mid x+1$

$-$

K

$\Rightarrow K = ?$

A) -5 B) -4 C) -3 D) 3 E) 5

10. $P(x+2) = x^3 - ax + 3$

$P(x+1) \mid x+2$

$-$

0

$\Rightarrow a = ?$

A) -4 B) -2 C) 4 D) 6 E) 8

11. $P(x-1) = x^2 - 2ax + 5 - a$

$P(x+1) \mid x+2$

$-$

0

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

12. $P(3x-1) = mx^2 - x + Q(x)$

$P(x) \mid x-5$ $\quad$ $Q(x) \mid x-2$

$-$ $\quad$ $-$

6 $\quad$ 0

$\Rightarrow m = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

13. $P(3x+2) = Q(x) + 3x - 2$

$P(x) \mid x+1$ $\quad$ $Q(x) \mid x+1$

$-$ $\quad$ $-$

-1 $\quad$ K

$\Rightarrow K = ?$

A) -5 B) -3 C) 2 D) 4 E) 5

14. $\dfrac{P(x+2) + 2x - 1}{Q(x-1)} = x^2 - 1$

$P(x) \mid x-4$ $\quad$ $Q(x) \mid x-1$

$-$ $\quad$ $-$

3 $\quad$ K

$\Rightarrow K = ?$

A) 2 B) 3 C) 5 D) 7 E) 8

15. $P(x) \mid x-1$ $\quad$ $Q(x) \mid x-1$

$-$ $\quad$ $-$

2 $\quad$ 3

$P(2x-1) \cdot x^2 \cdot Q(4-3x) \mid x-1$

$-$

K

$\Rightarrow K = ?$

A) 4 B) 6 C) 7 D) 10 E) 11

16. $(x+3) \cdot P(x) = x^3 + 3x^2 - x - 3$

$P(x) \mid x+3$

$-$

K

$\Rightarrow K = ?$

A) 0 B) 5 C) 7 D) 8 E) 9

1. $x^6 - 2x^3 + 1 \,|\, x^3 - 2$

$-$

K

$\Rightarrow K = ?$

A) 1 B) 3 C) 5 D) 7 E) 9

2. $3x^{15} - 2x^{10} + 4x^5 + 1 \,|\, x^5 + 2$

$-$

K

$\Rightarrow K = ?$

A) – 41 B) – 40 C) – 39 D) – 23 E) – 7

3. $x^{12} - 3x^8 + 6 \,|\, x^4 - 2$

$-$

K

$\Rightarrow K = ?$

A) 2 B) 6 C) 8 D) 12 E) 16

4. $3x^3 - mx^2 + nx - 2 \,|\, x^2 + 1$

$-$

0

$\Rightarrow m + n = ?$

A) – 5 B) – 2 C) 0 D) 2 E) 5

5. $x^6 - 3x^4 + ax^3 + bx + 2 \,|\, x^3 + 1$

$-$

0

$\Rightarrow a + b = ?$

A) – 6 B) 0 C) 2 D) 3 E) 6

6. $P(x^3 + 1) = x^9 - 3x^6 + 2x^3 - 2$

$P(x) \,|\, x - 2$

$-$

K

$\Rightarrow K = ?$

A) – 2 B) –1 C) 0 D) 1 E) 2

7. $x^9 + 4x^7 + 2x^3 + mx + n \,|\, x^3 + 2$

$-$

$4x + 2$

$\Rightarrow m + n = ?$

A) –2 B) 0 C) 1 D) 2 E) 3

8. $2x^4 - x^3 + ax^2 + bx - 2 \,|\, x^2 + 1$

$-$

$4x - 2$

$\Rightarrow a + b = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

9. $x^2 - ax - b + 1 \,|\, (x-2)\cdot(x+3)$ $\Rightarrow a + b = ?$

$-$

0

A) 6 B) 5 C) 0 D) – 5 E) – 6

10. $x^3 - ax^2 + 2x + b \,|\, (x+1)\cdot(x-2)$ $\Rightarrow a = ?$

$-$

0

A) – 2 B) – 1 C) 1 D) 3 E) 5

11. $x^3 + ax^2 + 2x + b \,|\, (x-2)\cdot(x+1)$ $\Rightarrow a - b = ?$

$-$

0

A) –15 B) –13 C) – 5 D) – 3 E) 13

12. $x^3 + nx^2 + mx - 1 \,|\, x^2 - 1$ $\Rightarrow n - m = ?$

$-$

0

A) –1 B) 0 C) 1 D) 2 E) 3

13. $P(x-1) = x^3 - 3x^2 + ax + b$

$P(x) \,|\, x^2 - 3x - 4$ $\Rightarrow a = ?$

$-$

0

A) – 2 B) – 5 C) –10 D) –15 E) – 20

14. $x^3 - ax^2 + b + 1 \,|\, x^2 - x$ $\Rightarrow a + b = ?$

$-$

$-2x + 3$

A) – 5 B) – 2 C) 0 D) 2 E) 5

15. $ax^3 - 2x^2 + 3x + n \,|\, x^2 - x$ $\Rightarrow a = ?$

$-$

$nx + 1$

A) – 4 B) 0 C) 1 D) 2 E) 3

16. $P(x+3) \,|\, x^2 - 3x - 4$ $\quad P(x+1) \,|\, x - 1$ $\Rightarrow K = ?$

$-$ $\quad -$

$5x - 1 \qquad K$

A) – 6 B) – 4 C) – 2 D) 4 E) 5

1. $x^3 - x^2 - 2x - 1 \,|\, x^2 + x - 1$

$-$ K(x)

$\Rightarrow K(x) = ?$

A) $x - 4$ B) $-x - 1$ C) $x - 3$ D) $x + 1$ E) $2x + 4$

2. $3x^4 - 2x^3 - 2x \,|\, x^2 + x$

$-$ K(x)

$\Rightarrow K(x) = ?$

A) $-7x$ B) $-5x$ C) $-3x$ D) $-x$ E) x

3. $x^4 + 3x^2 + mx + n \,|\, x^2 - x + 2$

$-$ $2x - 3$

$\Rightarrow m \cdot n = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

4. $2x^4 + x^2 + ax + b \,|\, x^2 - 2x + 2$

$-$ 0

$\Rightarrow a + b = ?$

A) -4 B) 6 C) 8 D) 9 E) 12

5. $x^3 + ax^2 + 2x - b \,|\, (x - 1)^2$

$-$ $13x - 7$

$\Rightarrow b = ?$

A) 4 B) 3 C) 2 D) 1 E) -1

6. $x^3 - 4x^2 + m \,|\, (x + 1)^2$

$-$ $11x + 12$

$\Rightarrow m = ?$

A) 2 B) 3 C) 6 D) 8 E) 9

7. $P(x) \,|\, x - 2$ $-$ 4 $\quad$ $P(x) \,|\, x + 1$ $-$ -2 $\quad$ $P(x) \,|\, x^2 - x - 2$ $-$ K(x)

$\Rightarrow K(x) = ?$

A) $2x$ B) x C) $-2x$ D) $2x - 1$ E) $-2x - 1$

8. $P(x) \,|\, x - 3$ $-$ 3 $\quad$ $P(x) \,|\, x + 3$ $-$ 5 $\quad$ $P(x) \,|\, x^2 - 9$ $-$ K(x)

$\Rightarrow K(x) = ?$

A) $-\frac{x}{3} + 4$ B) $\frac{x}{3}$ C) 4 D) $2x + 1$ E) $2x - 1$

9. $P(x) \mid x-1$, remainder -2; $P(x) \mid x+4$, remainder 13; $P(x) \mid x^2+3x-4$, remainder $K(x)$

$\Rightarrow K(x) = ?$

A) $-3x+1$ B) $x-3$ C) $x+1$ D) $2x-1$ E) $x+3$

10. $P(x) \mid x-1$, remainder -2; $P(x) \mid x+1$, remainder -6; $P(x) \mid x^2-1$, remainder $K(x)$

$\Rightarrow K(x) = ?$

A) $2x-2$ B) $2x+2$ C) $2x-4$ D) $4x+2$ E) $2x+4$

11. $P(x) \mid x^3+1$, remainder x^2-3x+7; $P(x) \mid x^2-x+1$, remainder $K(x)$ $\Rightarrow K(x) = ?$

A) $-2x+6$ B) $x+3$ C) $-2x-4$ D) $2x+6$ E) $4x-3$

12. $P(x) \mid x^2-1$, remainder $x+1$; $P(x) \mid x-1$, remainder K $\Rightarrow K = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

13. $P(x) \mid x^3-1$, remainder x^2+2x-2; $P(x) \mid x-1$, remainder K $\Rightarrow K = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

14. $P(x) \mid x^2-4x-5$, remainder $2x-1$; $P(x) \mid x+1$, remainder K $\Rightarrow K = ?$

A) -1 B) -2 C) -3 D) -4 E) -5

15. $P(x) \mid x^3+8$, remainder x^2; $P(x) \mid x^2-2x+4$, remainder $K(x)$ $\Rightarrow K(x) = ?$

A) $x-3$ B) $2x+3$ C) $2x-4$ D) $4-2x$ E) $2x-3$

16. $P(x) \mid x^3-1$, remainder x^2-1; $P(x) \mid x^2+x+1$, remainder $K(x)$ $\Rightarrow K(x) = ?$

A) $8x+1$ B) $8x-1$ C) $x-2$ D) $-2x-1$ E) $-x-2$

1. $x^3 - ax^2 + 2x - 1 \,\big|\, x + 1$

$-$

-2

$\Rightarrow a = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

2. $ax^2 + 3x + 2 \,\big|\, x - 2$

$-$

12

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

3. $P(x-1) = x^2 - 4x + 4$

$P(x+4) \,\big|\, x - 3$

$-$

K

$\Rightarrow K = ?$

A) 44 B) 42 C) 36 D) 32 E) 28

4. $P(x) \,\big|\, x - 1$ $\quad$ $Q(x) \,\big|\, x + 2$

$-$ $\quad$ $-$

3 $\quad$ 2

$H(x) = \dfrac{P(x+1) + x + 1}{Q(x-2)}$ $\quad \Rightarrow H(0) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

5. $2x^3 + x^2 + bx + c \,\big|\, x^2 - 2$

$-$

$x + 3$

$\Rightarrow b + c = ?$

A) -4 B) -3 C) -2 D) -1 E) 1

6. P(x) polinom

P(x) polynomial

$P(x) = \dfrac{2x^2 + ax + 3}{x - 3}$

$\Rightarrow P(3) = ?$

A) -4 B) -1 C) 3 D) 5 E) 11

7. $P(x) \,\big|\, x + 2$ $\quad$ $P(x) \,\big|\, x - 1$ $\quad$ $P(x) \,\big|\, x^2 + x - 2$

$-$ $\quad$ $-$ $\quad$ $-$

3 $\quad$ 6 $\quad$ $K(x)$

$\Rightarrow K(x) = ?$

A) $x + 4$ B) $x + 5$ C) $2x + 5$ D) $x - 5$ E) $x + 1$

8. $P(x) + 2P(-x) = 2x + 5$

$P(x) \,\big|\, x - 2$

$-$

K

$\Rightarrow K = ?$

A) $-\frac{7}{3}$ B) $-\frac{5}{3}$ C) $\frac{3}{5}$ D) $\frac{7}{5}$ E) $\frac{7}{3}$

9. $x^3 - mx^2 - 7x - n \,\big|\, x^2 - 3x - 4$ $\Rightarrow \frac{m}{n} = ?$

$-$

0

A) -2 B) -1 C) $\frac{1}{2}$ D) 2 E) 4

10. $x^3 - ax + b \,\big|\, (x-1)^2$ $\Rightarrow a \cdot b = ?$

$-$

0

A) -6 B) -2 C) 0 D) 1 E) 6

11. $P(x, y) = (x + y - 2)^2 + (x + y - 5)$

$P(x, y) \,\big|\, x + y - 1$ $\Rightarrow K = ?$

$-$

K

A) -4 B) -3 C) 2 D) 4 E) 7

12. $x^3 - x^2 + x + 1 \,\big|\, x^2 + x + 1$ $\Rightarrow K(x) = ?$

$-$

$K(x)$

A) $4x + 3$ B) $4x - 3$ C) $2x + 3$ D) $-3x + 4$ E) $3x + 4$

13. $P(x) \,\big|\, x$ $P(x) \,\big|\, x - 2$ $P(x) \,\big|\, x^2 - 2x$

$-$ $-$ $-$

0 10 $K(x)$

$\Rightarrow K(x) = ?$

A) $3x - 4$ B) $3x + 4$ C) $-3x + 4$ D) $2x + 4$ E) $5x$

14. $P(x-1) \,\big|\, x$ $Q(x-2) \,\big|\, x - 3$

$-$ $-$

2 -3

$x \cdot P(x-2) + a \cdot Q(x) \,\big|\, x^2 - x$ $\Rightarrow a = ?$

$-$

5

A) -2 B) -1 C) 1 D) 2 E) 3

15. $2x^2 + ax - 1 \,\big|\, x - 1$ $\Rightarrow a = ?$

$-$

3

A) -1 B) 0 C) 1 D) 2 E) 3

16. $P(x) = ax^3 + bx^2 + cx + d$

$P(1) = P(-2) = P(3) = 0$

$P(2) = -8$

$P(x-2) \,\big|\, x - 1$ $\Rightarrow K = ?$

$-$

K

A) -16 B) -8 C) 8 D) 12 E) 16

1. P(x) sabit polinom

P(x) constant polynomial

$P(x) = (a^3 - 27) \cdot x^4 + 6$

$\Rightarrow a = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

2. P(x) sabit polinom

P(x) constant polynomial

$P(x) = (a - 3) \cdot x^2 + (b - 1) \cdot x + a \cdot b$

$\Rightarrow P(3) = ?$

A) – 2 B) –1 C) 1 D) 2 E) 3

3. $P(x) = (a - 2) \cdot x^2 + (b + 1) \cdot x + a + b + c$

$P(x) = x$

$\Rightarrow c = ?$

A) – 2 B) –1 C) 0 D) 1 E) 2

4. $P(x) = (a + b - 3) \cdot x^2 + (a - b - 2) \cdot x + c - 2$

$P(x) = x$

$\Rightarrow a + c = ?$

A) 0 B) 2 C) 4 D) 5 E) 6

5. P(x) polinom

P(x) polynomial

$P(x) + P(x + 1) = 4x$

$\Rightarrow P(x) = ?$

A) $x - 1$ B) $2x$ C) $2x + 1$ D) $2x - 1$ E) $4x - 2$

6. P(x) polinom

P(x) polynomial

$P(2x) + P(3x) = 5x + 4$

$\Rightarrow P(2) = ?$

A) 4 B) 5 C) 6 D) 7 E) 8

7. Pozitif katsayılı P(x) polinomu

P(x) positive coefficient polynomial

$P(x) \cdot P(2x) = 8x^2 + 6x + 1$

$\Rightarrow P(x) = ?$

A) $2x$ B) $x - 1$ C) $2x + 1$ D) $3x - 1$ E) $1 - 3x$

8. $x^3 - 2x^2 + x - 2 = (x - 2) \cdot P(x)$

$\Rightarrow P(x) = ?$

A) $x^2 + 1$ B) $x^2 - 1$ C) $x^2 + x$ D) $x^2 + x - 1$ E) $x^2 + x + 1$

9. Q(x) polinom

Q(x) polynomial

$(x-2)\cdot Q(x) = a\cdot x^2 - 6x + 4$

$\Rightarrow Q(5) = ?$

A) 3 B) 4 C) 5 D) 8 E) 12

10. $(a-1)\cdot x^2 + b\cdot x + c + 1 = x^2 - 1$

$\Rightarrow a + b + c = ?$

A) – 2 B) –1 C) 0 D) 1 E) 2

11.

$$\begin{array}{l|l} x^4 - 2x^2 + a & x+2 \\ \hline -\quad\quad\quad\quad & \\ \quad\quad 0 & \end{array}$$

$\Rightarrow a = ?$

A) – 8 B) – 6 C) – 4 D) – 2 E) 0

12. $d[P(x)] = 3$

$\Rightarrow d\left[\left(P(x^3)\right)^2\right] = ?$

A) 3 B) 6 C) 8 D) 12 E) 18

13. $d[P(x)] = 2$

$\Rightarrow d\left[P\left(P(x^3)\right)\right] = ?$

A) 6 B) 8 C) 12 D) 18 E) 20

14. $d[P(x)] = 4$

$\Rightarrow d\left[P^2(x^3-1)\right] = ?$

A) 30 B) 24 C) 18 D) 14 E) 12

15. $d\,[P(x)] = 3$

$\Rightarrow d\,[P^2(x)] = ?$

A) 6 B) 9 C) 12 D) 18 E) 24

16. $\dfrac{P(x)}{Q(x)} = x^2 + 4$

$\Rightarrow \min\left(d\left[\left(P(x^3)\cdot Q(x^2)\right]\right)\right) = ?$

A) 6 B) 11 C) 15 D) 17 E) 19

1. $d[P(x) \cdot Q^2(x)] = 26$

$\frac{d[P^2(x)]}{d[Q(x)]} = \frac{6}{5}$

$\Rightarrow d[2 \cdot P^2(x) + 3 \cdot Q(x)] = ?$

A) 10 B) 12 C) 18 D) 24 E) 30

2. $d[P^2(x) \cdot Q^3(x)] = 17$

$d\left[\frac{P(x)}{Q(x)}\right] = 1$

$\Rightarrow d[Q(x)] = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

3. $A, B \in R$

$\frac{5x+5}{2x^2+x-3} = \frac{A}{x-1} + \frac{B}{2x+3}$

$\Rightarrow A + B = ?$

A) –3 B) –1 C) 0 D) 1 E) 3

4. $A, B \in R$

$\frac{3x-21}{3x^2-9x-12} = \frac{A}{2x+2} + \frac{B}{x-4}$

$\Rightarrow A = ?$

A) $\frac{16}{5}$ B) 3 C) $\frac{11}{5}$ D) 2 E) $\frac{9}{5}$

5. $A, B \in R$

$\frac{7x+2}{15x^2-7x-4} = \frac{A}{15x-12} + \frac{B}{9x+3}$

$\Rightarrow B = ?$

A) $\frac{115}{17}$ B) 6 C) $\frac{17}{3}$ D) $\frac{17}{4}$ E) $\frac{3}{17}$

6. $P(x) = \frac{x^3-x^2+x-1}{x-1}$

$\Rightarrow P(1) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

7. $P(3x + 5) = 2x - 3$

$\Rightarrow P(x + 6) = ?$

A) $\frac{x-2}{3}$ B) $\frac{2x-3}{7}$ C) $\frac{2x-7}{3}$ D) $\frac{7x-2}{3}$ E) $\frac{7x-3}{2}$

8. $P(x - 2) = x^3 - 6x^2 + 12x - 7$

$\Rightarrow P(x) = ?$

A) x^3 B) $x^3 - 1$ C) $(x - 1)^3$ D) $x^3 + 1$ E) $(x + 1)^3$

9.

$$\begin{array}{r|l} P(x) & x+3 \\ \hline - & \\ \hline 6 & \end{array} \qquad \begin{array}{r|l} P(x) & x+2 \\ \hline - & \\ \hline 4 & \end{array} \qquad \begin{array}{r|l} P(x) & x^2+5x+6 \\ \hline - & \\ \hline K(x) & \end{array}$$

$\Rightarrow K(x) = ?$

A) $6x + 4$ B) $4x - 6$ C) $-2x$ D) $2x + 10$ E) $10x + 2$

10. P(x) polinom

P(x) polynomial

$P(1 - x) \cdot P(1 + x) = 9 - 4x^2$

$P(0) = 5$

$\Rightarrow P(1) = ?$

A) -3 B) -2 C) 0 D) 2 E) 3

11. $P(x) = x^8 - 4x^6 + 3x^4 - 2x^2 + k$

$$\begin{array}{r|l} P(x) & x^2-3 \\ \hline - & \\ \hline 2 & \end{array}$$

$\Rightarrow k = ?$

A) 6 B) 8 C) 10 D) 12 E) 14

12. $P(x) = x^4 - 6x^2 + m + 10$

$$\begin{array}{r|l} P(x) & x-\sqrt{3} \\ \hline - & \\ \hline 6 & \end{array}$$

$\Rightarrow m = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

13. P(x) polinom

P(x) polynomial

$(x + 2) \cdot P(x) = x^5 + 5x^4 + 3x^2 + ax$

$\Rightarrow P(-2) = ?$

A) -40 B) -48 C) -62 D) -72 E) -80

14. $P(x) = x^3 + ax^2 + b - 2$

$$\begin{array}{r|l} P(x) & x^2-2x-1 \\ \hline - & \\ \hline 7x+3 & \end{array} \qquad \Rightarrow b = ?$$

A) 1 B) 2 C) 3 D) 4 E) 5

15. $\dfrac{Q(3x+1)}{P(x)} = 2x^2 - x + 3$

$$\begin{array}{r|l} P(x) & x-3 \\ \hline - & \\ \hline 2 & \end{array} \qquad \begin{array}{r|l} Q(x) & x-10 \\ \hline - & \\ \hline K & \end{array} \qquad \Rightarrow K = ?$$

A) 16 B) 18 C) 24 D) 32 E) 36

16. $P(x + 3) = ax + b$

$$\begin{array}{r|l} P(x+6) & P(x-3) \\ \hline - & \\ \hline K & \end{array}$$

$\Rightarrow K = ?$

A) $-9a$ B) $-3a$ C) $3b$ D) $3a$ E) $9a$

1. $P(x) = (6x^2 - 8x + 4)^3 + 3x^2 - 4x + 2$
$Q(x) = -2(5x - 4)^3 - 10x + 8$
$\Rightarrow d\,[P^3(x) \cdot Q^3(x)] = ?$

A) 9 B) 18 C) 27 D) 36 E) 40

2. $P(x) = (2x^3 - 4nx^2 + 18x + 6) \cdot (5x^2 + 4x - 3n + 1)$
$Q(x) = Ax^7 + Bx^6 + Cx^5 + Dx^4 + Ex^3 + Fx^2 + Gx + H$
$P(x) = Q(x)$
$D = E$
$\Rightarrow n = ?$

A) – 4 B) 10 C) 12 D) 40 E) 42

3. P(x) polinom
P(x) polynomial

$P(x) = 2x^{\frac{12}{n+4}} + 4x^{n-2} - 3$
$\Rightarrow \max(d[P(x)]) = ?$

A) 2 B) 4 C) 6 D) 8 E) 10

4. $A, B \in R$

$$\frac{2x+8y}{(x+y)^2-(x-y)^2} = \frac{A}{x} + \frac{B}{4y}$$

$\Rightarrow A - B = ?$

A) 0 B) 1 C) 2 D) 3 D) 4

5. $A, B \in R$

$$\frac{2x+1}{9x^2+6x+1} = \frac{A}{3x+1} + \frac{B}{(3x+1)^2}$$

$\Rightarrow B = ?$

A) 3 B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) $\frac{2}{3}$ E) $\frac{1}{3}$

6. $a, b, c, d, e \in R$
$(x - 2) \cdot (x - 3) \cdot (x - 4) \cdot (x - 5) = ax^4 + bx^3 + cx^2 + dx + e$
$\Rightarrow a + c + e = ?$

A) – 12 B) 24 C) 72 D) 180 E) 192

7. $P(mx + n) = nx + m$
$\Rightarrow P(0) = ?$

A) $\frac{mn+m}{n}$ B) $\frac{mn-n}{m}$ C) $\frac{m^2-n^2}{m}$ D) $\frac{m^2-n^2}{n}$ E) $\frac{n^2-m^2}{m}$

8. $P(1 - x) = x^3 - 3x^2 + 3x - 1$
$\Rightarrow P(x + 1) = ?$

A) $(x - 1)^3$ B) $(-x + 1)^3$ C) $-(x - 1)^3$ D) $-(x + 1)^3$ E) $(x + 1)^3$

9. $P(x) = ax + b$

$P(x + 1) - P(x - 1) = 12$

$P(0) = -75$

$\Rightarrow P(13) = ?$

A) 7 B) 3 C) 0 D) –3 E) –7

10. $k \in N$

$P(x) = (2x)^{k+1} + (x + 1)^k - 2x + 2$

$$\begin{array}{r|l} P(x) & x - 1 \\ \hline - & \\ \hline 24 & \end{array} \quad \Rightarrow k = ?$$

A) –2 B) 0 C) 2 D) 3 E) 4

11. $\begin{array}{r|l} P(x) & x - m \\ \hline - & \\ \hline m & \end{array}$, $\begin{array}{r|l} P(x) & x - n \\ \hline - & \\ \hline n & \end{array}$, $m \neq n$

$$\begin{array}{r|l} P(x) & x^2 - (m + n) \cdot x + m \cdot n \\ \hline - & \\ \hline K(x) & \end{array} \quad \Rightarrow K(x) = ?$$

A) $x + 2$ B) 2 C) $x - 2$ D) –2 E) x

12. $P(x) = ax^3 - 4x^2 + bx - \frac{16}{3}$

$$\begin{array}{r|l} P(x) & (x - 2)^3 \\ \hline - & \\ \hline 0 & \end{array} \quad \Rightarrow b = ?$$

A) $\frac{2}{3}$ B) 3 C) $\frac{7}{2}$ D) 6 E) 8

13. $(x + 1) \cdot P(x) = x^3 + 5x^2 + px - 8$

$\Rightarrow P(-1) = ?$

A) – 4 B) – 6 C) – 9 D) – 11 E) – 13

14. $P(x) = (Q(x) - 3) \cdot (4x^2 + 6x - 1) + 2mx + 1$

$\begin{array}{r|l} P(x) & 2x - 1 \\ \hline - & \\ \hline 0 & \end{array}$ $\begin{array}{r|l} Q(x) & 2x - 1 \\ \hline - & \\ \hline 0 & \end{array}$

$\Rightarrow m = ?$

A) 10 B) 8 C) 6 D) 4 E) 2

15. P(x) polinom

P(x) polynomial

$P(x) + P(2x) + P(3x) = 12x + 12$

$\Rightarrow P(x) = ?$

A) $2x + 4$ B) $4x + 4$ C) $3x + 4$ D) $4x + 3$ E) $2x + 3$

16. $P(x) = (x^2 - 5x + 4)^5 + 3(x^2 - 5x) - 8$

$$\begin{array}{r|l} P(x) & x^2 - 5x + 3 \\ \hline - & \\ \hline K & \end{array} \quad \Rightarrow K = ?$$

A) – 28 B) – 26 C) – 24 D) – 20 E) – 16

POLİNOMLAR
POLYNOMIALS

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	B	A	C	D	A	D	A	D	E	C	D	B	E	A	A

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	B	C	C	E	E	C	D	D	B	A	E	B	A	A

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	C	E	A	A	D	C	A	D	C	B	D	D	C	C	B

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	B	B	C	B	E	A	E	B	D	A	E	A	B	B

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	B	D	B	C	B	C	D	E	C	C	B	E	A	A

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	D	D	C	C	B	C	A	E	E	B	D	A	B	D

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	C	A	E	B	A	D	D	A	E	B	D	C	E	B	A

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	A	B	C	D	C	A	A	A	C	A	E	A	C	C	E

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	A	C	B	C	D	B	A	C	E	B	C	E	B	D	E

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	A	D	D	A	C	A	D	C	A	E	C	B	A	A

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	C	E	A	E	B	C	D	C	E	B	E	C	B	E	E

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	C	A	E	E	C	D	B	D	E	E	D	B	A	E

II. DERECEDEN DENKLEMLER
QUADRATIC EQUATIONS

II. DERECEDEN EŞİTSİZLİKLER
QUADRATIC INEQUATIONS

PARABOL
PARABOLA

II. DERECEDEN DENKLEMLER

ÖZELLİK | Property 1

$a \neq 0 \quad a, b, c \in R$

$ax^2 + bx + c = 0$

denklemi ikinci dereceden bir bilinmeyenli denklemdir. İkinci dereceden denklem çarpanlarına ayrılabiliyorsa ifade çarpanlarına ayrılarak kök bulunur.

The equation above is an unknown quadratic equation with one unknown. The root of the given second degree equation above can be found by factorization.

$$ax^2 + bx + c = 0$$

$$(mx + n) \cdot (kx + p) = 0$$

$$\Rightarrow x_1 = -\frac{n}{m} \qquad x_2 = -\frac{p}{k}$$

$$\Rightarrow S.S. = \left\{-\frac{n}{m}, -\frac{p}{k}\right\}$$

1. $x^2 - 9 = 0$

$\Rightarrow$ S.S. = ?

$\{-3, 3\}$

2. $2x^2 - 8 = 0$

$\Rightarrow$ S.S. = ?

$\{-2, 2\}$

3. $x^2 = 4x$

$\Rightarrow$ S.S. = ?

$\{0, 4\}$

4. $x^2 - 2x = x$

$\Rightarrow$ S.S. = ?

$\{0, 3\}$

5. $x^2 - 3x + 2 = 0$

$\Rightarrow$ S.S. = ?

$\{1, 2\}$

6. $x^2 - 5x - 14 = 0$

$\Rightarrow$ S.S. = ?

$\{-2, 7\}$

7. $x^2 - 6x + 8 = 0$

$\Rightarrow$ S.S. = ?

$\{2, 4\}$

8. $x^2 - 10x + 16 = 0$

$\Rightarrow$ S.S. = ?

$\{2, 8\}$

9. $x^2 - 8x + 12 = 0$

$\Rightarrow$ S.S. = ?

$\{2, 6\}$

ÖZELLİK | Property 2

$a \neq 0 \quad a, b, c \in R$

$ax^2 + bx + c = 0$

$S.S. = \{x_1, x_2\}$

denklemi çarpanlarına ayrılmıyorsa
$\Delta = b^2 - 4ac$ olmak üzere

if the equation can not be divided to its multipliers then $\Delta = b^2 - 4ac$

$x_1 = \dfrac{-b + \sqrt{\Delta}}{2a} \qquad x_2 = \dfrac{-b - \sqrt{\Delta}}{2a}$

1. $x^2 - 6x + 7 = 0$
$\Rightarrow S.S. = ?$

$\{3 - \sqrt{2}, 3 + \sqrt{2}\}$

2. $x^2 - 4x - 1 = 0$
$\Rightarrow S.S. = ?$

$\{2 - \sqrt{5}, 2 + \sqrt{5}\}$

3. $x^2 - 8x + 13 = 0$
$\Rightarrow S.S. = ?$

$\{4 - \sqrt{3}, 4 + \sqrt{3}\}$

4. $x^2 - 6x + 2 = 0$
$\Rightarrow S.S. = ?$

$\{3 - \sqrt{7}, 3 + \sqrt{7}\}$

5. $x^2 - 2x - 2 = 0$
$\Rightarrow S.S. = ?$

$\{1 - \sqrt{3}, 1 + \sqrt{3}\}$

6. $x^2 - 8x + 10 = 0$
$\Rightarrow S.S. = ?$

$\{4 - \sqrt{6}, 4 + \sqrt{6}\}$

7. $x^2 - 5x + 3 = 0$
$\Rightarrow S.S. = ?$

$\left\{\dfrac{5 + \sqrt{13}}{2}, \dfrac{5 - \sqrt{13}}{2}\right\}$

II. DERECEDEN DENKLEMLER

ÖZELLİK | Property 3

Negatif sayılarının karekökü reel bir sayı olmadığından;
As square root of a negative number are not real numbers;

$$ax^2 + bx + c = 0$$

denkleminin kökleri, Δ'nın işaretine göre aşağıdaki gibidir:
the roots of the equation change according to the symbol of Δ as below:

- $\Delta > 0$ ise denkleminin iki reel kökü vardır.
  $\Delta > 0$ equation has two real roots.
  $x_1 = \dfrac{-b+\sqrt{\Delta}}{2a}$ $\quad x_2 = \dfrac{-b-\sqrt{\Delta}}{2a}$
- $\Delta = 0$ ise denkleminin kökleri birbirine eşittir.
  The roots of $\Delta = 0$ equation are equal.
  $x_1 = x_2 = \dfrac{-b}{2a}$
- $\Delta < 0$ ise denkleminin reel kökü yoktur.
  There is no real roots for $\Delta < 0$ equation.

1. $ax^2 - 8x + 16 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2 \Rightarrow a = ?$ — **1**

2. $a \in R^+$
$x^2 + (a+1)x + 36 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2 \Rightarrow a = ?$ — **11**

3. $a \in R^-$
$x^2 - (a-2)x + 4 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2 \Rightarrow a = ?$ — **−2**

4. $a \in R^+$
$x^2 - (a+2)x + 2a + 1 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2 \Rightarrow a = ?$ — **4**

5. $x^2 - 10x + (a+6) = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2 \Rightarrow a = ?$ — **19**

6. $x^2 + 6x + (a-2) = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2 \Rightarrow a = ?$ — **11**

7. $x^2 + 8ax + 16 = 0$
S.S. = Ø
$\Rightarrow ? < a < ?$ — **$-1 < a < 1$**

8. $x^2 + 4x + (a+1) = 0$
S.S. = Ø
$\Rightarrow ? < a < ?$ — **$3 < a$**

9. $x^2 - (a+1)x + 9 = 0$
S.S. = Ø
$\Rightarrow ? < a < ?$ — **$-7 < a < 5$**

10. $ax^2 + 8x + 1 = 0$
Denkleminin iki farklı kökü varsa "a" hangi aralıkta değer alır?
If the equation has two different roots, which interval will "a" be located in? — **$(-\infty, 16)$**

11. $(a+1)x^2 - 2x + 3 = 0$
Denkleminin iki farklı kökü varsa "a" hangi aralıkta değer alır?
If the equation has two different roots, which interval will "a" be located in? — **$\left(-\infty, -\dfrac{2}{3}\right)$**

12. $x^2 - 4x + a = 0$
Denkleminin iki farklı kökü varsa "a" hangi aralıkta değer alır?
If the equation has two different roots, which interval will "a" be located in? — **$(-\infty, 4)$**

13. $x^2 - 6x + (a+1) = 0$
Denkleminin iki farklı kökü varsa "a" hangi aralıkta değer alır?
If the equation has two different roots, which interval will "a" be located in? — **$(-\infty, 8)$**

14. $ax^2 - 4x + a = 0$
Denkleminin iki farklı kökü varsa "a" hangi aralıkta değer alır?
If the equation has two different roots, which interval will "a" be located in? — **$(-2, 2)$**

ÖZELLİK | Property 4

$a \neq 0 \quad a, b, c \in R$

$ax^2 + bx + c = 0$

S.S. = $\{x_1, x_2\}$ ⇒ kökler arasında *(between roots)*

- $x_1 + x_2 = \frac{-b}{a}$
- $x_1 \cdot x_2 = \frac{c}{a}$
- $|x_1 - x_2| = \frac{\sqrt{\Delta}}{|a|}$

bağıntıları mevcuttur. *(correlation exists.)*

1. $x^2 - 4x - 8 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 + x_2 = ?$ **4**

2. $x^2 - 12x - 36 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 \cdot x_2 = ?$ **–36**

3. $x^2 + (m + 1)x - 4 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 + x_2 = 8$
$\Rightarrow m = ?$ **–9**

4. $ax^2 - 2x + (a + 1) = 0$
S.S. = $\{x_1, x_2\}$
$x_1 \cdot x_2 = 2$
$\Rightarrow a = ?$ **1**

5. $x^2 - 8x + 6 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 + x_2 + x_1 \cdot x_2 = ?$ **14**

6. $x^2 - (2m + 1)x + m = 0$
S.S. = $\{x_1, x_2\}$
$x_1 + x_2 = x_1 \cdot x_2$
$\Rightarrow m = ?$ **–1**

7. $x^2 - 4x - 3 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow (x_1 - 1) \cdot (x_2 - 1) = ?$ **– 6**

8. $x^2 - 6x + 2 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1^2x_2 + x_1x_2^2 = ?$ **12**

9. $2x^2 - (a - 1)x - 4 = 0$
S.S. = $\{x_1, x_2\}$
$\frac{1}{x_1} + \frac{1}{x_2} = -2$
$\Rightarrow a = ?$ **9**

10. $x^2 - 3x - a = 0$
S.S. = $\{x_1, x_2\}$
$x_1 - x_2 = 5$
$\Rightarrow a = ?$ **4**

11. $2x^2 - 6x + m = 0$
S.S. = $\{x_1, x_2\}$
$x_1 - x_2 = 1$
$\Rightarrow m = ?$ **4**

12. $2x^2 - mx + 4 = 0$
S.S. = $\{x_1, x_2\}$
$2x_1^2x_2 = 16$
$\Rightarrow m = ?$ **9**

13. $x^2 - (x_1 + 3)x - 12 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 = ?$ **– 4**

14. $x^2 + (a + 1)x + c = 0$ S.S. = $\{x_1, 2\}$
$x^2 - (b - 2)x + d = 0$ S.S. = $\{x_1, -3\}$
$\Rightarrow a + b = ?$ **– 4**

15. $x^2 + bx - (k + 1) = 0$ S.S. = $\{x_1, 3\}$
$x^2 - cx + 2k = 0$ S.S. = $\{x_1, 4\}$
$\Rightarrow k = ?$ **$-\frac{2}{5}$**

II. DERECEDEN DENKLEMLER

ÖZELLİK | Property 5

$a \neq 0 \quad a, b, c \in R$

$ax^2 + bx + c = 0$

denkleminin kökleri {k, n} ise kökler denklemde yerine yazılırsa denklemi sağlar.

if the roots of the equation are {k, n} when they are put in the right place on the equation it will provide a correct equation.

$ak^2 + bk + c = 0$

$an^2 + bn + c = 0$

1. $x^2 - ax - 6 = 0$

S.S. = $\{-2, x_2\}$

$\Rightarrow a = ?$

1

2. $ax^2 - 5x + 2 = 0$

S.S. = $\{2, x_2\}$

$\Rightarrow a = ?$

2

3. $3x^2 - (a + 1)x + 4 = 0$

S.S. = $\{2, x_2\}$

$\Rightarrow a = ?$

7

4. $8x^2 - ax + 1 = 0$

S.S. = $\left\{\frac{-1}{2}, x_2\right\}$

$\Rightarrow a = ?$

-6

5. $3x^2 - 7x + a = 0$

S.S. = $\{1, x_2\}$

$\Rightarrow a = ?$

4

6. $2x^2 + ax - 4 = 0$

S.S. = $\{-4, x_2\}$

$\Rightarrow x_2 = ?$

$\frac{1}{2}$

7. $3x^2 + (a + 1)x - 6 = 0$

S.S. = $\{-3, x_2\}$

$\Rightarrow x_2 = ?$

$\frac{2}{3}$

ÖZELLİK | Property 6

Köklü ifadelerde; köklü ifade eşitliğin tek tarafına alınarak her iki tarafın karesi alınır. Bu şekilde bulunan kökler, verilen denklemde yerine yazılarak kökler kontrol edilir.

In radical expressions; the radical is placed in one side of the equation and then squares of both sides are taken. The roots which are found by this way are placed on the equation to control the accuracy.

1. $\sqrt{2x - 1} = x$

$\Rightarrow$ S.S. = ?

{1}

2. $\sqrt{4x + 5} = x$

$\Rightarrow$ S.S. = ?

{5}

3. $x = \sqrt{6x - 8}$

$\Rightarrow$ S.S. = ?

{2, 4}

4. $\sqrt{2a + 6} = a - 1$

$\Rightarrow$ S.S. = ?

{5}

5. $\sqrt{2x + 17} - \sqrt{x} = 3$

$\Rightarrow$ S.S. = ?

{4, 16}

6. $\sqrt{x + 1 + \sqrt{x + 3}} = 2$

$\Rightarrow x = ?$

1

7. $x - 1 = 2\sqrt{x + 1} + 1$

$\Rightarrow x = ?$

8

ÖZELLİK | Property 7

Bazı denklemlerde uygun bir parametre değişimi ile ikinci derece denklem elde edilir.

In some equations, change of a reliable parameter will result in a quadratic equation.

Örnek | Example

- $x^2 - 5|x| + 6 = 0$
  $(x^2 = |x|^2)$ $\quad |x| = t$
  $\Rightarrow t^2 - 5t + 6 = 0$
- $9^x - 4 \cdot 3^x + 3 = 0$
  $3^x = t$
  $\Rightarrow t^2 - 4t + 3 = 0$
- $x^4 - 5x^2 + 4 = 0$
  $x^2 = t$
  $\Rightarrow t^2 - 5t + 4 = 0$
- $\left(\frac{x}{x+1}\right)^2 - 7\left(\frac{x}{x+1}\right) + 12 = 0$
  $\left(\frac{x}{x+1}\right) = t \Rightarrow t^2 - 7t + 12 = 0$

$\sum x$: x değerlerinin toplamı

$\sum x$: *sum of x values*

$\prod x$: x değerlerinin çarpımı

$\prod x$: *Multiplication of x values*

S.S. : Çözüm kümesi

S.S. : *Solution set*

1. $x^4 - 13x^2 + 36 = 0$
S.S. $= \{x_1, x_2, x_3, x_4\}$
$\Rightarrow \sum x = ?$ $\quad$ 0

2. $x^4 - 8x^2 + 12 = 0$
S.S. $= \{x_1, x_2, x_3, x_4\}$
$\Rightarrow \prod x = ?$ $\quad$ 12

3. $(x-1)^2 - (x-1) - 12 = 0$
S.S. $= \{x_1, x_2\}$
$\Rightarrow x_1 + x_2 = ?$ $\quad$ 3

4. $(x+2)^2 + (x+2) - 6 = 0$
S.S. $= \{x_1, x_2\}$
$\Rightarrow x_1 \cdot x_2 = ?$ $\quad$ 0

5. $4^x - 10 \cdot 2^x + 16 = 0$
S.S. $= \{x_1, x_2\}$
$\Rightarrow x_1 + x_2 = ?$ $\quad$ 4

6. $9^x - 4 \cdot 3^x + 3 = 0$
S.S. $= \{x_1, x_2\}$
$\Rightarrow x_1 + x_2 = ?$ $\quad$ 1

7. $(x^2 + 2x)^2 - 2(x^2 + 2x) - 3 = 0$
S.S. $= \{x_1, x_2, x_3, x_4\}$
$\Rightarrow \prod x = ?$ $\quad$ 3

8. $\left(\frac{x-1}{x}\right)^2 - 5\left(\frac{x-1}{x}\right) + 6 = 0$
$\Rightarrow$ S.S. $= ?$ $\quad$ $\left\{\frac{-1}{2}, -1\right\}$

9. $x^2 + 3|x| - 4 = 0$
$\Rightarrow \sum x = ?$ $\quad$ 0

10. $x^2 - 2|x| - 3 = 0$
$\Rightarrow \prod x = ?$ $\quad$ -9

II. DERECEDEN DENKLEMLER

TEST 1

1. $x^2 - 4 = 0$
$\Rightarrow$ S.S. = ?

A) $\{-2\}$ B) $\{2\}$ C) $\{0\}$ D) $\{0, 2\}$ E) $\{-2, 2\}$

2. $x \in R$
$-x^2 - 9 = 0$
$\Rightarrow$ S.S. = ?

A) $\{-3\}$ B) $\{0\}$ C) $\{3\}$ D) $\{-3, 3\}$ E) $\emptyset$

3. $4x^2 - 16 = 0$
$\Rightarrow$ S.S. = ?

A) $\{2\}$ B) $\{-2\}$ C) $\{-2, 2\}$ D) $\{0, 2\}$ E) $\{4\}$

4. $x^2 - 3x = x$
$\Rightarrow$ S.S. = ?

A) $\{0\}$ B) $\{4\}$ C) $\{-4\}$ D) $\{0, -4\}$ E) $\{0, 4\}$

5. $x^2 + 5x + 6 = 0$
$\Rightarrow$ S.S. = ?

A) $\{-2\}$ B) $\{2\}$ C) $\{-2, -3\}$ D) $\{2, 3\}$ E) $\{-2, 3\}$

6. $6x^2 - 7x - 3 = 0$
$\Rightarrow$ S.S. = ?

A) $\{-1\}$ B) $\{-3\}$ C) $\left\{\frac{3}{2}\right\}$ D) $\left\{\frac{3}{2}, -\frac{1}{3}\right\}$ E) $\{-1, -3\}$

7. $3x^2 - 48 = 0$
$\Rightarrow$ S.S. = ?

A) $\{-2\}$ B) $\{-2, 2\}$ C) $\{3\}$ D) $\{-4\}$ E) $\{-4, 4\}$

8. $a \neq 0$
$ax^2 - (a^2 + 1)x + a = 0$
$\Rightarrow$ S.S. = ?

A) $\{a + 1\}$ B) $\{a - 1\}$ C) $\left\{\frac{1}{a}, a\right\}$ D) $\left\{\frac{1}{a}, 1\right\}$ E) $\{-a, 0\}$

9. $x^2 - 2x - 2 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 = ?$

A) $-1+\sqrt{3}$ B) $-2+\sqrt{3}$ C) $1+\sqrt{3}$ D) $\sqrt{3}$ E) $2+\sqrt{3}$

10. $x^2 - 4x + 2 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 = ?$

A) $2+2\sqrt{2}$ B) $2-\sqrt{3}$ C) $2+\sqrt{3}$ D) $2-\sqrt{2}$ E) $1-\sqrt{2}$

11. $x \in R$
$x^2 + 4 = 0$
$\Rightarrow$ S.S. = ?

A) $\{-4\}$ B) $\{-2\}$ C) $\{2\}$ D) $\{-2, 2\}$ E) $\emptyset$

12. $x \in R$
$x^2 + x + 3 = 0$
$\Rightarrow$ S.S. = ?

A) $\{1\}$ B) $\{-1, 1\}$ C) $\emptyset$ D) $\{-2\}$ E) $\{-2, 2\}$

13. $mx^2 + 2x + m + 2 = 0$
S.S. = $\{1, x_2\}$
$\Rightarrow m = ?$

A) -3 B) -2 C) -1 D) 0 E) 2

14. $2ax^2 + (a-1)x - 4 = 0$
S.S. = $\{-1, x_2\}$
$\Rightarrow a = ?$

A) -2 B) 0 C) 1 D) 2 E) 3

15. $2x^2 + (a+1)x - 4 = 0$
S.S. = $\{a, x_2\}$
$\Rightarrow \sum a = ?$

A) $-\frac{1}{3}$ B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 1 E) 2

16. $x^2 + (a+1)x + b = 0$
S.S. = $\{-1, 2\}$
$\Rightarrow a + b = ?$

A) -5 B) -4 C) -2 D) 2 E) 4

1. $ax^2 - 16x + 32 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow a = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

2. $m \in N$
$x^2 - (m - 3)x + m = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow \prod m = ?$

A) 9 B) 8 C) 6 D) 5 E) 4

3. $x^2 - (a - 4)x + 4 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow \sum a = ?$

A) 3 B) 4 C) 5 D) 6 E) 8

4. $x^2 - (a - 3)x + a = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow \prod a = ?$

A) 8 B) 9 C) 10 D) 12 E) 15

5. $m \in Z^+$
$x^2 + 2(m + 1)x + 4m + 1 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow m = ?$

A) 2 B) 3 C) 4 D) 6 E) 8

6. $2mx^2 + 8x + 1 = 0$
Denklemin iki farklı kökü varsa "m" için aşağıdakilerden hangisi doğrudur?
Which of the following is correct for "m" if the equation has two different roots?

A) $4 > m$ B) $8 \geq m$ C) $8 > m$ D) $4 < m$ E) $m \geq 8$

7. $mx^2 + 6x + m = 0$
Denklemin iki farklı kökü varsa "m" için aşağıdakilerden hangisi doğrudur?
Which of the following is correct for "m" if the equation has two different roots?

A) $m \leq 3$ B) $m < 3$ C) $-3 \leq m$ D) $m < -3$ E) $-3 < m < 3$

8. $x^2 - 4x + b + 2 = 0$
Denklemin iki farklı kökü varsa b'nin en büyük tamsayı değeri kaç olabilir?
If this equation has two different roots what could be the largest value of "b"?

A) –3 B) –2 C) –1 D) 0 E) 1

9. $m \in Z$
$3x^2 - 6x + m = 0$
S.S. = Ø
$\Rightarrow$ min (m) = ?

A) 3 B) 4 C) 5 D) 6 E) 7

10. $ax^2 - (2a - 1)x + a + 1 = 0$
S.S. = Ø
a için aşağıdakilerden hangisi doğrudur?
Which of the following expression of "a" is correct?

A) $a < \frac{1}{8}$ B) $a > -\frac{1}{8}$ C) $a < -\frac{1}{8}$
D) $a > \frac{1}{4}$ E) $a > \frac{1}{8}$

11. $x^2 - 4ax + 4 = 0$
S.S. = Ø
a için aşağıdakilerden hangisi doğrudur?
Which of the followings expression of "a" is correct??

A) $a > 1$ B) $a < -1$ C) $a < 1$
D) $0 < a < 2$ E) $-1 < a < 1$

12. $4x^2 + (a - 2)x + 16 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow \sum a = ?$

A) –18 B) –16 C) –8 D) 0 E) 4

13. $a \in R^+$
$4x^2 - (a + 1)x + 25 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow a = ?$

A) 3 B) 9 C) 13 D) 17 E) 19

14. $x^2 - 6x + (2a - 5) = 0$
S.S. = $\{x_1, 3\}$
$\Rightarrow a = ?$

A) 5 B) 6 C) 7 D) 8 E) 9

15. $x^2 - (a + 2)x - 16 = 0$
S.S. = $\{x_1, 2\}$
$\Rightarrow a = ?$

A) –8 B) –4 C) 0 D) 4 E) 8

16. $x^2 + (2a - 1)x - 10 = 0$
S.S. = $\{x_1, 1\}$
$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

1. $x^2 + (m + 3)x - 6 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 + x_2 = 6$
$\Rightarrow m = ?$

A) -9 B) -7 C) -6 D) 0 E) 3

2. $2x^2 - (m - 2)x + 5 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 + x_2 = 4$
$\Rightarrow m = ?$

A) 6 B) 8 C) 9 D) 10 E) 11

3. $5x^2 - 6x + ax - 6 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 + x_2 = -2$
$\Rightarrow a = ?$

A) -4 B) 1 C) 2 D) 12 E) 16

4. $ax^2 + 4x + 3a - 4 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 \cdot x_2 = 1$
$\Rightarrow a = ?$

A) -2 B) -1 C) 1 D) 2 E) 3

5. $3x^2 - 6x + 5 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow \frac{5}{x_1} + \frac{5}{x_2} = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

6. $x^2 - 6x + 4 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 \cdot x_2^2 + x_1^2 \cdot x_2 = ?$

A) -24 B) -12 C) 4 D) 12 E) 24

7. $5x^2 + (m - 2)x + 3m - 2 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 + x_2 = x_1 \cdot x_2$
$\Rightarrow m = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

8. $x^2 + (a - 2)x + 4 = 0$
S.S. = $\{x_1, x_2\}$
$(x_1 + 1) \cdot (x_2 + 1) = 5$
$\Rightarrow a = ?$

A) -4 B) -2 C) 2 D) 3 E) 4

9. $2x^2 - (4m - 1)x + m = 0$

S.S. = $\{x_1, x_2\}$

$\frac{1}{x_1} + \frac{1}{x_2} = \frac{11}{3}$

$\Rightarrow m = ?$

A) -2 B) -1 C) 1 D) 2 E) 3

10. $x^2 - 8x + 17 = 0$

S.S. = $\{x_1, x_2\}$

$\Rightarrow \frac{1}{x_1 - 3} + \frac{1}{x_2 - 3} = ?$

A) -3 B) -2 C) -1 D) 1 E) 2

11. $x^2 + 4x + m = 0$

S.S. = $\{x_1, x_2\}$

$\frac{1}{x_1 - 2} + \frac{1}{x_2 - 2} = -\frac{1}{2}$

$\Rightarrow m = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

12. $ax^2 + (2a + 1)x + 3 + a = 0$

S.S. = $\{x_1, x_2\}$

$x_1 + x_2 = 3 \cdot x_1 \cdot x_2$

$\Rightarrow a = ?$

A) -4 B) -2 C) 0 D) 1 E) 2

13. $x^2 - 3x + 6 = 0$

S.S. = $\{x_1, x_2\}$

$\Rightarrow \left(x_1 + \frac{1}{x_2}\right) \cdot \left(x_2 + \frac{1}{x_1}\right) = ?$

A) -1 B) 1 C) $\frac{3}{2}$ D) $\frac{7}{6}$ E) $\frac{49}{6}$

14. $x^2 - 6ax + 2 = 0$

S.S. = $\{x_1, x_2\}$

$|x_1 - x_2| = 2\sqrt{2}$

$\Rightarrow a^2 = ?$

A) 1 B) $\frac{2}{3}$ C) $\frac{4}{9}$ D) $\frac{4}{27}$ E) $\frac{16}{81}$

15. $2a^2 - 3a - 5 = 0$

S.S. = $\{a_1, a_2\}$

$\Rightarrow a_1^2 - a_2^2 = ?$

A) $\frac{17}{4}$ B) $\frac{21}{4}$ C) $\frac{31}{4}$ D) $\frac{35}{4}$ E) $\frac{49}{4}$

16. $m \in Z^-$

$x^2 + (m - 2)x - 5 = 0$

S.S. = $\{x_1, x_2\}$

$x_1^2 + x_2^2 = 26$

$\Rightarrow m = ?$

A) -2 B) -3 C) -4 D) -6 E) -8

1. $x^2 + 2x - 6 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow \frac{1}{x_1^2} + \frac{1}{x_2^2} = ?$

A) $-\frac{1}{2}$ B) $-\frac{4}{9}$ C) 0 D) $\frac{4}{9}$ E) $\frac{9}{4}$

2. $x^2 - 3x + m + 1 = 0$
S.S. = $\{x_1, x_2\}$
$x_1^2 + x_2^2 = 1$
$\Rightarrow m = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

3. $x^2 - 4x + 1 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow \frac{1}{\sqrt{x_1}} + \frac{1}{\sqrt{x_2}} = ?$

A) $\frac{\sqrt{2}}{9}$ B) $\frac{\sqrt{2}}{3}$ C) $\sqrt{2}$ D) $\sqrt{6}$ E) $3\sqrt{2}$

4. $a^2 - 3a + 1 = 0$
S.S. = $\{a_1, a_2\}$
$\Rightarrow \frac{a_2}{\sqrt{a_1}} + \frac{a_1}{\sqrt{a_2}} = ?$

A) $\sqrt{5}$ B) 5 C) $2\sqrt{5}$ D) 8 E) 10

5. $x^2 - 9x + 2a = 0$
S.S. = $\{x_1, x_2\}$
$2x_1 - x_2 = 6$
$\Rightarrow a = ?$

A) 4 B) 5 C) 9 D) 10 E) 12

6. $x^2 - 27x + 1 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow \left| x_1\sqrt{x_2} - x_2\sqrt{x_1} \right| = ?$

A) 1 B) 2 C) 3 D) 5 E) 6

7. $2x^2 - 4x + m + 1 = 0$
S.S. = $\{x_1, x_2\}$
$3x_1 - 2x_2 = 11$
$\Rightarrow m = ?$

A) -7 B) -6 C) -5 D) -4 E) -3

8. $m \in Z^+$
$x^2 - (m + 2)x + 6 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = 6 \cdot x_2$
$\Rightarrow m = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

9. $x^2 + (a + 2)x + 4 = 0$
S.S. $= \{x_1, x_2\}$
$x_1^2 \cdot x_2 = 8$
$\Rightarrow a = ?$

A) –8 B) –6 C) –4 D) 2 E) 4

10. $x^2 - 8x + a = 0$
S.S. $= \{x_1, x_2\}$
$2x_1 + x_2 = 6$
$\Rightarrow a = ?$

A) –20 B) –10 C) –8 D) –6 E) –4

11. $3x^2 + ax - 6 = 0$
S.S. $= \{x_1, x_2\}$
$x_1 + \frac{1}{x_2} = \frac{1}{2}$
$\Rightarrow a = ?$

A) –3 B) –2 C) 1 D) 2 E) 3

12. $x^2 - (x_1 - 2)x + x_2 - 4 = 0$
S.S. $= \{x_1, x_2\}$
$\Rightarrow x_1 \cdot x_2 = ?$

A) –8 B) –7 C) –6 D) 6 E) 8

13. $x^2 - ax + n = 0$ S.S. $= \{x_1, 2\}$
$x^2 + (a + 1)x + m = 0$ S.S. $= \{x_1, -1\}$
$\Rightarrow a = ?$

A) –3 B) –1 C) 1 D) 2 E) 4

14. $x^2 + (a - 3)x + b = 0$ S.S. $= \{x_1, -3\}$
$x^2 - (3 + b)x + c = 0$ S.S. $= \{x_1, -5\}$
$\Rightarrow a + b = ?$

A) –6 B) –4 C) –2 D) 2 E) 4

15. $x^2 - 2(a + c + 2)x - 8 = 0$ S.S. $= \{a, b\}$
$x^2 - \left(\frac{2a + b}{2}\right)x + k = 0$ S.S. $= \{a, c\}$
$\Rightarrow k = ?$

A) – 4 B) – 8 C) – 12 D) – 15 E) – 16

16. $x^2 - ax + (n + k) = 0$ S.S. $= \{m, n\}$
$x^2 + ax - 12 = 0$ S.S. $= \{m, k\}$
$\Rightarrow m \cdot n \cdot k = ?$

A) – 24 B) –12 C) 6 D) 12 E) 24

1. $x^4 - 20x^2 + 64 = 0$
S.S. = $\{x_1, x_2, x_3, x_4\}$
$\Rightarrow \sum x = ?$

A) 10 B) 6 C) 0 D) –6 E) –10

2. $x^4 - 6x^2 + 8 = 0$
$\Rightarrow \min(x) = ?$

A) –4 B) –2 C) –1 D) 0 E) 1

3. $(x-2)^2 - 5(x-2) + 6 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1 + x_2 = ?$

A) –9 B) –1 C) 1 D) 5 E) 9

4. $(x^2 + x)^2 - 4(x^2 + x) + 3 = 0$
S.S. = $\{x_1, x_2, x_3, x_4\}$
$\Rightarrow \prod x = ?$

A) –6 B) –3 C) 1 D) 3 E) 6

5. $4^x - 20 \cdot 2^x + 64 = 0$
$\Rightarrow$ S.S. = ?

A) {4, 16} B) {1, 4} C) {1, 2} D) {0, 1) E) {2, 4}

6. $2^{2x} - 6 \cdot 2^x + 8 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow \sum x = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

7. $3^{2x} - 27 = 6 \cdot 3^x$
$\Rightarrow x = ?$

A) –3 B) –2 C) 1 D) 2 E) 3

8. $\left(\frac{1}{x-3}\right)^2 + \frac{3}{x-3} - 4 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow \prod x = ?$

A) –11 B) –4 C) $\frac{11}{4}$ D) 4 E) 11

9. $\frac{x^2-4x-5}{x^2+6x+8}=0$

$\Rightarrow$ S.S. = ?

A) {–5} B) {–1} C) {1} D) {5} E) {–1, 5}

10. $\frac{x^2-7x+6}{x^2-1}=0$

$\Rightarrow$ S.S. = ?

A) {–6} B) {–1} C) {6} D) {–1, 6} E) {1, 6}

11. $x-2-\frac{x-2}{x}=0$

$\Rightarrow$ S.S. = ?

A) {1} B) {–1} C) {–2, 2} D) {0, 1} E) {1, 2}

12. $\frac{x}{x-1}=\frac{x-1}{x+1}$

$\Rightarrow x = ?$

A) –1 B) 0 C) $\frac{1}{3}$ D) 1 E) $\frac{3}{2}$

13. $\frac{4x}{x-2}-x+3=\frac{8}{x-2}$

$\Rightarrow$ S.S. = ?

A) {1, 2} B) {0, 7} C) {2} D) {7} E) {2, 7}

14. $\frac{x^2-9}{x+3}+\frac{x+3}{x-3}=0$

$\Rightarrow$ S.S. = ?

A) {–2, 2} B) {3} C) Ø D) {–1, 6} E) {2, 3}

15. $\left(\frac{x}{x-2}\right)^2-3\cdot\left(\frac{x}{x-2}\right)-4=0$

S.S. = $\{x_1, x_2\}$

$\Rightarrow x_1 + x_2 = ?$

A) $-\frac{8}{3}$ B) –1 C) 1 D) $\frac{8}{3}$ E) $\frac{11}{3}$

16. $\left(\frac{x+2}{x}\right)^2+4\left(\frac{x+2}{x}\right)+4=0$

$\Rightarrow x = ?$

A) $-\frac{1}{3}$ B) $-\frac{2}{3}$ C) 0 D) $\frac{2}{3}$ E) 1

1. $\sqrt{4x+5}=x$
$\Rightarrow$ S.S. = ?

A) {1} B) {5} C) {–1, 5} D) {–3, 1} E) {–1, 1}

2. $x-2=\sqrt{22-x}$
$\Rightarrow$ S.S = ?

A) {–2, 4} B) {–2, 2} C) {–3, 6} D) {–3} E) {6}

3. $x+2=\sqrt{11-2x}$
$\Rightarrow x = ?$

A) –7 B) –1 C) 1 D) 2 E) 7

4. $\sqrt{a-3}=9-a$
$\Rightarrow$ S.S. = ?

A) {7} B) {4} C) {7, 12} D) {7, 4} E) {–2, 1}

5. $\sqrt{x+2+\sqrt{x-1}}=3$
$\Rightarrow x = ?$

A) 1 B) 3 C) 5 D) 7 E) 10

6. $\sqrt{2-x+\sqrt{x+4}}=0$
$\Rightarrow x = ?$

A) 0 B) 2 C) 3 D) 4 E) 5

7. $\sqrt{2a+6}=a+2$
S.S. = $\{a_1, a_2\}$
$\Rightarrow a_1 + a_2 = ?$

A) –2 B) –1 C) 2 D) 3 E) 4

8. $2x=3\sqrt{2x+5}+5$
$\Rightarrow x = ?$

A) 10 B) 5 C) 1 D) –1 E) –5

9. $|2x-1|=3$
$\Rightarrow \sum x = ?$

A) -2 B) -1 C) 1 D) 3 E) 4

10. $x^2-|3x|=0$
$\Rightarrow$ S.S. = ?

A) $\{-3, 3\}$ B) $\{3\}$ C) $\{-3\}$ D) $\{0, 3\}$ E) $\{-3, 0, 3\}$

11. $x^2+5\cdot|x|-6=0$
$\Rightarrow \sum x = ?$

A) -6 B) -1 C) 0 D) 1 E) 6

12. $|x-1|=|x+2|$
$\Rightarrow x = ?$

A) $-\frac{3}{2}$ B) -1 C) $-\frac{1}{2}$ D) 0 E) 1

13. $|x^2-9|-|x+3|=0$
$\Rightarrow \sum x = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

14. $|x+1|^2-3\cdot|x+1|-4=0$
S.S. = $\{x_1, x_2, ..., x_n\}$
$\Rightarrow n = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

15. $|x-3|=3x-5$
$\Rightarrow$ S.S. = ?

A) $\{1, 2\}$ B) $\{-2\}$ C) $\{1\}$ D) $\{2\}$ E) $\{3\}$

16. $x^2+|x-2|=2x$
$\Rightarrow$ S.S. = ?

A) $\{-1\}$ B) $\{0, 1\}$ C) $\{1\}$ D) $\{-1, 1\}$ E) $\{1, 2\}$

1. $\frac{2x+1}{x-3} - \frac{x+1}{x+2} = 0$

S.S. = $\{x_1, x_2\}$

$\Rightarrow x_1 + x_2 = ?$

A) 2 B) –1 C) $-\frac{3}{2}$ D) $-\frac{7}{2}$ E) –7

2. $x^2 + (m-4)x + 27 = 0$

S.S. = $\{x_1, x_2\}$

$x_1 = x_2^2$

$\Rightarrow m = ?$

A) –8 B) –5 C) 0 D) 5 E) 13

3. $m \in Z^+$

$3x^2 - x + 2mx - 4 = 0$

S.S. = $\{x_1, m\}$

$\Rightarrow m = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

4. $x^2 + (x_1 + 2)x + 2x_2 = 0$

S.S. = $\{x_1, x_2\}$

$\Rightarrow \frac{1}{x_1} + \frac{1}{x_2} = ?$

A) –4 B) $-\frac{1}{3}$ C) $\frac{1}{3}$ D) $\frac{2}{3}$ E) 4

5. $x^2 - 3x + 2b = 0$

S.S. = $\{x_1, x_2\}$

$x_1^2 - x_2^2 = 15$

$\Rightarrow b = ?$

A) –4 B) –2 C) 2 D) 4 E) 6

6. $2^{2x} - 3 \cdot 2^x - 4 = 0$

$\Rightarrow x = ?$

A) 3 B) 2 C) 1 D) –1 E) –2

7. $x^2 - (a+1)x + b^3 + 1 = 0$

S.S. = $\{x_1, x_2\}$

$x_1 + x_2 = 4$

$x_1 \cdot x_2 = 9$

$\Rightarrow a \cdot b = ?$

A) –6 B) –4 C) 4 D) 6 E) 12

8. $x^2 + mx + n = 0$, S.S. = $\{x_1, x_2\}$

$x^2 - 2x + m = 0$, S.S. = $\{x_1 - 1, x_2 - 1\}$

$\Rightarrow m + n = ?$

A) –11 B) –5 C) –2 D) 7 E) 11

9. $\sqrt{x^2-3x-4}+\sqrt{x-4}=0$

$\Rightarrow$ S.S. = ?

A) $\{-4\}$ B) $\varnothing$ C) $\{-1, 4\}$ D) $\{-1, 1\}$ E) $\{4\}$

10. $\dfrac{3x^3\cdot(x^2-9)}{x^4-2x^2+1}=0$

$\Rightarrow$ S.S. = ?

A) $\{0, 3\}$ B) $\{-3, 3\}$ C) $\{-3, 0, 3\}$ D) $\varnothing$ E) $\{1, 3\}$

11. $x^2-4x+a+1=0$

S.S. = $\{x_1, x_2\}$

$x_1-x_2=-2$

$\Rightarrow a = ?$

A) 6 B) 4 C) 2 D) -1 E) -2

12. $3^{2x}-9\cdot 3^x=0$

$\Rightarrow$ S.S. = ?

A) $\{0, 2\}$ B) $\{1, 2\}$ C) $\{0\}$ D) $\{2\}$ E) $\{1\}$

13. $x+2=\sqrt{19+2x}$

$\Rightarrow$ S.S. = ?

A) $\varnothing$ B) $\{3\}$ C) $\{-5\}$ D) $\{3, -5\}$ E) $\{1\}$

14. $(x^2-x)^2-14\cdot(x^2-x)+24=0$

$\Rightarrow$ S.S. = ?

A) $\{-3, -1, 2, 4\}$ B) $\{1, 2, 3, 4\}$ C) $\{-1, -2, -3, -4\}$ D) $\{1, 3\}$ E) $\{2, 4\}$

15. $2x^2+6x+1-a=0$

Denklemin iki farklı kökü varsa "a"nın en küçük tamsayı değeri kaçtır?

If this equation has two different roots what could be the smallest value of "a"?

A) -7 B) -6 C) -5 D) -4 E) -3

16. $\left(x+\dfrac{1}{x}\right)^2+6\left(x+\dfrac{1}{x}\right)+9=0$

S.S. = $\{x_1, x_2\}$

$\Rightarrow x_1^2+\dfrac{1}{x_1^2}=?$

A) 11 B) 9 C) 7 D) 5 E) 3

1. $x^2 - 3x + a + 2 = 0$
S.S. = $\{1, x_2\}$
$\Rightarrow a = ?$

A) –1 B) 0 C) 1 D) 2 E) 3

2. $(x^2 - 4)^2 \cdot (x^2 - 6x - 7) = 0$
S.S. = $\{x_1, x_2, \dots x_n\}$
$\Rightarrow n = ?$

A) 1 B) 2 C) 4 D) 5 E) 6

3. $(m + 1)x^2 - mx - 6 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 + x_2 = \frac{3}{4}$
$\Rightarrow m = ?$

A) $-\frac{3}{7}$ B) –1 C) 1 D) 2 E) 3

4. $x^2 + ax + 4 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow \sum a = ?$

A) – 4 B) – 2 C) 0 D) 2 E) 4

5. $2ax^2 - 6x + a - 1 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 \cdot x_2 = \frac{3}{8}$
$\Rightarrow a = ?$

A) –2 B) –1 C) 2 D) 3 E) 4

6. $x^2 - 4x - 6 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow \frac{1}{x_1 + 1} + \frac{1}{x_2 + 1} = ?$

A) – 6 B) – 4 C) $-\frac{3}{2}$ D) $\frac{6}{11}$ E) 5

7. $\frac{x^2 + 3x - 4}{x^2 - 1} = 0$
$\Rightarrow \sum x = ?$

A) – 5 B) – 4 C) –3 D) 4 E) 5

8. $x^2 + 2x - b = 0$, S.S. = $\{x_1, 2\}$
$x^2 - 4x + a = 0$, S.S. = $\{x_1, x_2\}$
$\Rightarrow a = ?$

A) – 32 B) – 8 C) 0 D) 8 E) 32

9. $\sqrt{x} - 3 \cdot \sqrt[4]{x} = 4$
$\Rightarrow$ S.S. = ?

A) {0, 256} B) {0, 16} C) {1, 256} D) {–1, 256} E) {256}

10. $3x^2 - 6x - 5 = 0$
S.S. = $\{x_1, x_2\}$
$\Rightarrow x_1^3 + x_2^3 = ?$

A) 24 B) 18 C) 16 D) 12 E) 8

11. $x^2 - x + m = 0$
$x_1 - x_2 = 3$
$\Rightarrow m = ?$

A) – 2 B) –1 C) 0 D) 4 E) 6

12. $x^4 - 29 \cdot x^2 + 100 = 0$
$\Rightarrow$ max (x) = ?

A) – 4 B) –1 C) 2 D) 4 E) 5

13. $x^2 + (a - 1)x + 9 = 0$
S.S. = $\{x_1, x_2\}$
$\sqrt{x_1} + \sqrt{x_2} = 4 \Rightarrow a = ?$

A) 11 B) 10 C) – 4 D) – 9 E) – 11

14. $3\left(\frac{x-2}{x-3}\right) - \left(\frac{x-3}{x-2}\right) - 2 = 0$
$\Rightarrow x = ?$

A) – 2 B) $-\frac{1}{2}$ C) 1 D) $\frac{3}{4}$ E) $\frac{9}{4}$

15. $mx^2 - (m - 3)x + 1 = 0$
S.S. = $\{x_1, x_2\}$
$x_1 = x_2$
$\Rightarrow$ min (m) = ?

A) 1 B) 2 C) 6 D) 8 E) 9

16. $x^2 + x - 3 = 0$ S.S. = $\{x_1, x_2\}$
$x^2 + bx + c = 0$ S.S. = $\{x_1 + 3x_2, x_2 + 3x_1\}$
$\Rightarrow x^2 + bx + c = ?$

A) $x^2 + 4x - 9$ B) $x^2 - 4x - 9$
C) $x^2 - 4x + 9$ D) $x^2 + 2x + 3$
E) $x^2 - x + 3$

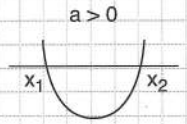
II. DERECEDEN EŞİTSİZLİKLER

ÖZELLİK | Property 1

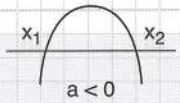
$$f(x) = ax^2 + bx + c$$

$$\Delta = b^2 - 4ac > 0$$

	$-\infty$		x_1		x_2		$+\infty$
f(x)		+	0	−	0	+	



	$-\infty$		x_1		x_2		$+\infty$
f(x)		−	0	+	0	−	



İkinci dereceden denklem çarpanlarına ayrılıyorsa ayrılıp kökleri bulunur. a katsayısı pozitif ise kökler arasında ifade negatif, diğer aralıklarda pozitiftir. a katsayısı negatif ise kökler arasında pozitif, diğer aralıklarda negatiftir.

In quadratic equations the roots are found by factorization. if "a" is a positive factor then the expression between the roots is negative, in the other intervals it will be positive. If "a" is a negative factor then between roots it is positive and in other intervals it is negative.

Örnek | Example

$x^2 - x - 12 > 0$

Çözüm | Answer

$x^2 - x - 12 > 0$

$(x - 4)(x + 3) > 0$

		-3		4	
f(x)	+	0	−	0	+

$(-\infty, -3) \cup (4, +\infty)$

$R - [-3, 4]$

Örnek | Example

$(3 - x)(x + 7) \geq 0$

Çözüm | Answer

		-7		3	
f(x)	−	0	+	0	−

$[-7, 3]$

1. $x(x + 6) \leq 0$

$\Rightarrow$ S.S. = ? $\boxed{[-6, 0]}$

2. $x^2 - 3x \geq 0$

$\Rightarrow$ S.S. = ? $\boxed{(-\infty, 0] \cup [3, \infty)}$

3. $x^2 - 4x + 3 < 0$

$\Rightarrow$ S.S. = ? $\boxed{(1, 3)}$

4. $x^2 - 36 < 0$

$\Rightarrow$ S.S. = ? $\boxed{(-6, 6)}$

5. $2x^2 - 2x - 3 < x^2$

$\Rightarrow$ S.S. = ? $\boxed{(-1, 3)}$

6. $2x^2 - 11x + 12 > 0$

$\Rightarrow$ S.S. = ? $\boxed{\left(-\infty, \frac{3}{2}\right) \cup (4, \infty)}$

7. $x \in Z^+$

$8x - 12 \geq x^2$

$\Rightarrow \sum x = ?$ $\boxed{20}$

ÖZELLİK | Property 2

Eşitsizliklerde tüm ifadelerin çarpım veya bölüm durumunda olması gerekir. Ayrıca tüm ifadeler eşitsizliğin tek tarafında toplanır. Diğer tarafta sadece 0 bulunur.

Verilen eşitsizlik birinci dereceden denklemlerin çarpımı şeklinde yazılabiliyorsa denklemlerin kökleri sayı doğrusuna yerleştirilir. Sadece bir bölgenin işareti bulunur. Diğer bölgelerin işareti köklerde değiştirilerek yazılır.

In inequalities all of the expressions should be in multiplication or division position. Likewise all expressions should be placed in one side of the inequality on the other side there should be only 0.

In given inequality if it can be written in the form of a multiplication of linear equation, the roots of the equation are placed on the number line. Sign of only one region is found. Sign of the other regions rely on the symbols of roots.

Örnek | Example

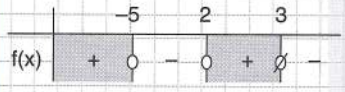
$$\frac{(2-x)(x+5)}{(x-3)} \geq 0$$

Çözüm | Answer

$2 - x = 0 \Rightarrow x = 2$

$x + 5 = 0 \Rightarrow x = -5$

$x - 3 = 0 \Rightarrow x = 3$



S.S. = $(-\infty, -5] \cup [2, 3)$

1. $\frac{x-2}{x+1} < 0$

$\Rightarrow$ S.S. = ? $\boxed{(-1, 2)}$

2. $\frac{x+1}{3-x} \geq 0$

$\Rightarrow$ S.S. = ? $\boxed{[-1, 3)}$

3. $(1-x)(x+3) > 0$

$\Rightarrow$ S.S. = ? $\boxed{(-3, 1)}$

4. $\frac{(x-1)(x-3)}{x+4} > 0$

$\Rightarrow$ S.S. = ? $\boxed{(-4, 1) \cup (3, \infty)}$

5. $\frac{x^2+x-12}{x-2} \leq 0$

$\Rightarrow$ S.S. = ? $\boxed{(-\infty, -4] \cup (2, 3]}$

6. $\frac{(x+2)(x-3)}{x-4} \geq 0$

$\Rightarrow$ S.S. = ? $\boxed{[-2, 3] \cup (4, \infty)}$

7. $\frac{(7-x)(x+5)}{(x-1)(x-10)} \geq 0$

$\Rightarrow$ S.S. = ? $\boxed{[-5, 1) \cup [7, 10)}$

8. $\frac{x^2-4}{x^2+5x+6} \leq 0$

$\Rightarrow$ S.S. = ? $\boxed{(-3, 2] \setminus \{-2\}}$

ÖZELLİK | Property 3

Eşitsizlik sistemi çözülürken daima pozitif olan ifadeler iptal edilir.

In solving an inequality system always positive expressions are cancelled.

- $|f(x)| \geq 0$ Mutlak değerli ifade
  Expression of absolute value
- $n \in N$
  $[f(x)]^{2n} \geq 0$ Çift kuvvetli ifade
  Squared expression
- $a^x > 0$ Üstel fonksiyon
  $a > 0$ *Exponential function*
- $f(x) = ax^2 + bx + c > 0$ $\Delta < 0$
  $a > 0$

Reel kökü olmayan ikinci derece denklemler: a negatif sayı ise iptal edilir, fakat eşitsizlik yön değişir.

Quadratic equation without root: If "a" is a negative number it will be cancelled and only the direction of the sign will change.

- $n \in N$
  $f(x) > 0 \Rightarrow [f(x)]^{2n-1} > 0$
  $f(x) < 0 \Rightarrow [f(x)]^{2n-1} < 0$

  f(x) ile $[f(x)]^{2n-1}$ ifadesinin işareti aynı olduğundan tek kuvvetli ifadenin kuvveti iptal edilir.
  As the signs of f(x) and $[f(x)]^{2n-1}$ are the same the power of the exponential expression will be canceled. .

- İfadeler sadeleştirilebiliyorsa sadeleştirilir, fakat kökleri incelenir.
  If expressions can be simplified then they are simplified but only the roots will be analysed.

Not | Note

İptal edilen ifadelerin kökleri incelenir.

The roots of the cancelled expressions should be analyzed.

Örnek | Example

$$\frac{|x-3| \cdot 3^x \cdot (x-2) \cdot (x+7)^4 \cdot (x-9)}{(x^2+x+7) \cdot (x+5)^{99} \cdot (x-9)} \geq 0 \quad \Rightarrow \text{S.S.} = ?$$

Çözüm | Answer

- $|x-3| \geq 0$ iptal edilir *(canceled)*
  $x - 3 = 0 \Rightarrow x = 3$ olabilir *(could be)*
- $3^x > 0$ Üstel fonksiyon iptal edilir. Kök yok.
  Exponential function are canceled. No root.
- $(x+7)^4 \geq 0$ iptal edilir *(canceled)*
  $x + 7 = 0 \Rightarrow x = -7$ olabilir *(could be)*
- $(x-9)$ pay ve paydadan sadeleşir.
  Numerator and denominator are simplified.
  $x - 9 \neq 0 \Rightarrow x \neq 9 \Rightarrow$ x, 9 olamaz *(can not be)*
- $x^2 + x + 7$ ifadesinde *(statements')* $\Delta < 0$ kök yok, daima pozitif. İptal edilir. *(no root, always positive. Canceled.)*
- $(x+5)^{99}$ ifadesinin sadece kuvveti iptal edilir.
  Only the power of $(x+5)^{99}$ statement will be canceled.

$$\frac{(x-2)}{x+5} \geq 0$$

		−5		2	
f(x)	+	∅	−	0	+

$(-\infty, -5) \cup [2, \infty)$

Yukarıda elde edilen bilgilerde çözüm kümesine eklenir.
The information above will be added to the solution set.

$x = 3 \qquad x = -7 \qquad x \neq 9$

$\Rightarrow \{(-\infty, -5) \cup [2, \infty)\} \setminus \{9\}$

1. $\dfrac{(x-2)(x+4)^2}{x^2} < 0$

$\Rightarrow$ S.S. = ? $\boxed{(-\infty, 2) \setminus \{-4, 0\}}$

2. $\dfrac{(x^2-4x+4)x^3}{3-x} \geq 0$

$\Rightarrow$ S.S. = ? $\boxed{[0, 3)}$

3. $\dfrac{x^2-6x+5}{(x-4)^2} < 0$

$\Rightarrow$ S.S. = ? $\boxed{(1, 5) \setminus \{4\}}$

4. $\dfrac{(x^2+x+8)(x-3)}{x+2} < 0$

$\Rightarrow$ S.S. = ?

$(-2, 3)$

5. $\dfrac{(x^2+2x+15)|x-2|}{x-3} < 0$

$\Rightarrow$ S.S. = ?

$(-\infty, 3) \setminus \{2\}$

6. $\dfrac{3^x(x^2+2x-3)}{(x-5)^4} < 0$

$\Rightarrow$ S.S. = ?

$(-3, 1)$

7. $\dfrac{2^x(x^2+4x+28)}{(x-3)} \geq 0$

$\Rightarrow$ S.S. = ?

$(3, \infty)$

8. $\dfrac{(x^2-x-6)(3x-9)^2}{(x^2-4)} < 0$

$\Rightarrow$ S.S. = ?

$(2, 3)$

9. $\dfrac{(x^2+8)(4-2x)}{x+3} \geq 0$

$\Rightarrow$ S.S. = ?

$(-3, 2]$

10. $\dfrac{|x-2|(x-3)}{x^2-2x-3} \leq 0$

$\Rightarrow$ S.S. = ?

$(-\infty, -1) \cup \{2\}$

11. $\dfrac{2^{-x}|x-5|}{x^2-6x+5} \leq 0$

$\Rightarrow \sum x = ?$

9

12. $\dfrac{(1-x)^2(x^2-6x+40)}{5^x} \leq 0$

$\Rightarrow$ S.S. = ?

$\{1\}$

13. $\dfrac{x^2-7x+10}{x^2-2x+8} < 0$

$\Rightarrow$ S.S. = ?

$(2, 5)$

14. $\dfrac{x^3-6x^2+9x}{x^3-9x} \geq 0$

$\Rightarrow$ S.S. = ?

$(-\infty, -3) \cup (3, \infty)$

15. $\dfrac{x^2-9}{x-3} \leq 0$

$\Rightarrow$ S.S. = ?

$(-\infty, -3]$

16. $\dfrac{x^2-3x-4}{x+1} > 0$

$\Rightarrow$ S.S. = ?

$(4, \infty)$

17. $\dfrac{x^2-6x+8}{x-2} < 0$

$\Rightarrow$ S.S. = ?

$(-\infty, 4) \setminus \{2\}$

II. DERECEDEN EŞİTSİZLİKLER

TEST 1

1. $6x - 12 > 0$

$\Rightarrow$ S.S. = ?

A) $[2, \infty)$ B) $(-\infty, 2)$ C) $(2, \infty)$ D) $[3, \infty)$ E) $(-\infty, -3]$

2. $-3x - 18 < 0$

$\Rightarrow$ S.S. = ?

A) $(6, \infty)$ B) $(2, \infty)$ C) $(-2, \infty)$ D) $(-\infty, -6)$ E) $(-6, \infty)$

3. $4x + 5 \leq -2x - 13$

$\Rightarrow$ S.S. = ?

A) $[-3, \infty)$ B) $(-3, \infty)$ C) $(-\infty, -3)$ D) $(-\infty, -3]$ E) $[-3, 3)$

4. $2(x - 3) - 3(x + 1) \leq -14$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -5]$ B) $[5, \infty)$ C) $[-5, \infty)$ D) $(-\infty, -5)$ E) $(-\infty, 5]$

5. $x \in Z$

$-3 < \frac{2x+6}{3} \leq 10$

$\Rightarrow \sum x = ?$

A) 57 B) 53 C) 50 D) 45 E) 42

6. $x \in N$

$(x - 1) \cdot (x + 2) \leq (x - 3) \cdot (x - 2)$

S.S. = $\{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

7. $x \cdot (x + 4) \leq 0$

$\Rightarrow$ S.S. = ?

A) $(-4, 2)$ B) $(-4, 0)$ C) $(2, \infty)$ D) $[-4, 0]$ E) $(0, \infty)$

8. $x^2 - 2x \geq 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, 0] \cup [2, \infty)$ B) $(-\infty, 1]$ C) $[0, 2]$ D) $(-\infty, -1] \cup [0, \infty)$ E) $[0, \infty)$

9. $x^2 - 5x - 6 < 0$
$\Rightarrow$ S.S. = ?

A) $(-1, 6)$ B) $(1, 6)$ C) $(-6, 1)$ D) $(-1, 4)$ E) $(-4, -1)$

10. $x^2 > x - 2$
$\Rightarrow$ S.S. = ?

A) $(-2, 1)$ B) $(-1, 2)$ C) R D) $[1, 2]$ E) $[1, 4]$

11. $x + \frac{4}{x} < -2$
$\Rightarrow$ S.S. = ?

A) R B) $R \setminus \{2\}$ C) $\{2\}$ D) $\emptyset$ E) R^-

12. $x^2 > -4x + 5$
$\Rightarrow$ S.S. = ?

A) $\emptyset$ B) $(1, 5)$ C) $(-1, 5)$ D) $R \setminus (-5, 1)$ E) $R \setminus [-5, 1]$

13. $x \in Z^+$
$4x - 3 < x^2$
$\Rightarrow \min(x) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

14. $x \in Z$
$x^2 - 25 \leq 0$
$\Rightarrow \sum x = ?$

A) -25 B) -5 C) 0 D) 5 E) 25

15. $(x-3)^{32} \cdot (6-x)^2 \cdot (x-2) > 0$
$\Rightarrow$ S.S. = ?

A) $(2, \infty)$ B) $(3, \infty)$ C) $(2, \infty) \setminus \{3, 6\}$ D) $(3, \infty) \setminus \{4\}$ E) $\emptyset$

16. $x \in Z^-$
$(x-2) \cdot (x^2 - 27) \geq 0$
S.S. = $\{x_1, x_2, ..., x_n\}$
$\Rightarrow n = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

1. $\frac{x-3}{x+1} < 0$

$\Rightarrow$ S.S. = ?

A) $(-1, 3)$ B) $(-\infty, -1)$ C) $(-2, \infty)$ D) $(-3, 1)$ E) $(-1, -3)$

2. $a \in Z$

$\frac{a+2}{6-a} \geq 0$

$\Rightarrow \sum a = ?$

A) 9 B) 10 C) 12 D) 13 E) 14

3. $(2-x) \cdot (x+4) > 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -4)$ B) $(-4, 2)$ C) $[-4, 2)$ D) $(-4, \infty)$ E) $(2, \infty)$

4. $\frac{x^2-4}{x+2} \leq 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, 2)$ B) $(-2, 2]$ C) $(-2, 2]$ D) $(-\infty, 2] \setminus \{-2\}$ E) $(-2, 2)$

5. $\frac{x^2-2x+3}{x-1} \geq 0$

$\Rightarrow$ S.S. = ?

A) $(1, \infty)$ B) $[1, \infty)$ C) $(1, 3)$ D) $(-1, 3)$ E) $(-3, \infty)$

6. $x \in Z$

$\frac{x^2-4x+8}{x^2-16} \leq 0$

$\Rightarrow \sum x = ?$

A) -4 B) -1 C) 0 D) 1 E) 4

7. $\frac{(x-1)^2 \cdot (x-2)}{(x+3)^5} \geq 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -3)$ B) $[2, \infty)$ C) $(-3, 2]$ D) $(-3, 2) \cup \{1\}$ E) $(-\infty, -3) \cup [2, \infty) \cup \{1\}$

8. $\frac{(x-4)^2}{x^2-9} \geq 0$

$\Rightarrow$ S.S. = ?

A) $[3, \infty)$ B) $(-\infty, -3) \cup (3, 4]$ C) $(3, \infty)$ D) $R \setminus [-3, 3]$ E) $(3, \infty) \setminus \{4\}$

9. $\dfrac{x\cdot(x^2-4x+4)}{2-x} \le 0$

$\Rightarrow$ S.S. = ?

A) (0, 2) B) (0, 3) C) (2, 4) D) R \ (0, 2] E) R \ [0, 2)

10. $x \in Z$

$\dfrac{x^3\cdot(x^2-6x+9)}{4-x} \le 0$

$\Rightarrow \sum x = ?$

A) –26 B) –20 C) –16 D) –10 E) –7

11. $x \in Z^-$

$\dfrac{2x^4-8x^2}{x-1} > 0$

$\Rightarrow x = ?$

A) –5 B) –4 C) –3 D) –2 E) –1

12. $\dfrac{6x^3-x^4}{x^4+3x^3} > 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -3)$ B) $(6, \infty)$ C) $(-3, 6)$ D) $(0, 6)$ E) $(-3, 0) \cup (0, 6)$

13. $x \in Z$

$\dfrac{(x+2)\cdot(x-3)^2}{x^2} < 0$

$\Rightarrow$ max (x) = ?

A) –4 B) –3 C) –2 D) 0 E) 1

14. $x \in Z$

$\dfrac{x^3\cdot(x-6)^2}{x^3-4x} \le 0$

S.S. = $\{x_1, x_2, \dots x_n\}$

$\Rightarrow n = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

15. $\dfrac{(3-x^2)\cdot(x+4)^2}{x^4} \ge 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -3)$ B) $(-4, 0)$ C) $[\sqrt{3}, \infty)$ D) $[-\sqrt{3}, \sqrt{3}] \cup \{-4\} \setminus \{0\}$ E) $(0, \sqrt{3}] \cup \{-4\}$

16. $\dfrac{(x-3)\cdot(x^2-4)}{x^2-x-6} \le 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -2] \cup (2, 3)$ B) $(-\infty, 2] \setminus \{-2\}$ C) $(2, \infty)$ D) $[2, 3) \cup (6, \infty)$ E) $[-2, 3)$

1. $x \in Z$

$\frac{6}{x} > \frac{x}{2}$

$\Rightarrow \max(x) = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

2. $x \in Z$

$\frac{8}{x} \leq x$

$\Rightarrow \min(x) = ?$

A) –6 B) –5 C) –4 D) –3 E) –2

3. $\frac{2x}{x-3} \leq \frac{4}{3-x}$

$\Rightarrow$ S.S. = ?

A) $(-3, 2)$ B) $[-2, 3)$

C) $(-\infty, -2] \cup (3, \infty)$ D) $\left(\frac{3}{2}, 2\right]$

E) $\left[-2, \frac{3}{2}\right)$

4. $\frac{1}{x^2} < \frac{1}{2x-1}$

$\Rightarrow$ S.S. = ?

A) $(-\infty, 1)$ B) $\left(\frac{1}{2}, \infty\right) \setminus \{1\}$

C) $(1, \infty)$ D) R

E) $R \setminus \{1\}$

5. $m \in Z$

$x^2 - (m-2)x + 2m = 0$

S.S. = $\{x_1, x_2\}$

$\frac{x_1 + x_2}{x_1 \cdot x_2} > 0$

$\Rightarrow \sum m = ?$

A) –5 B) –3 C) –1 D) 1 E) 2

6. $m \in Z$

$x^2 - (4-m)x + m^2 - 9 = 0$

S.S. = $\{x_1, x_2\}$

$x_1^2 \cdot x_2 + x_2^2 \cdot x_1 < 0$

$\Rightarrow \min(m) = ?$

A) –2 B) –1 C) 1 D) 2 E) 3

7. $x^2 + 6x + a + 4 > 1$

S.S. = R

$\Rightarrow$ a hangi aralıkta değerler alır?

Which interval could "a" have values?

A) $(9, \infty)$ B) $(4, \infty)$ C) $(6, \infty)$

D) $(3, 4)$ E) $(-\infty, -6)$

8. $-x^2 + 8x - 6 < a$

S.S. = R

$\Rightarrow$ a hangi aralıkta değerler alır?

Which interval could"a" have values?

A) $(-\infty, -2)$ B) $(-4, 2)$ C) $(3, 4)$

D) $[-4, -2]$ E) $(10, \infty)$

9. $\forall x \in R$

$a \in Z$

$x^2 - 6x + 3a - 12 > 0$

$\Rightarrow \min(a) = ?$

A) 4 B) 5 C) 6 D) 7 E) 8

10. $x \in Z$

$\frac{(2-x)\cdot 3^x}{x+2} \geq 0$

S.S. $= \{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

11. $\frac{4^x}{|x-3|} > 0$

$\Rightarrow$ S.S. = ?

A) Ø B) R C) $(4, \infty)$ D) $(-\infty, 3)$ E) $R \setminus \{3\}$

12. $\frac{x-2}{\sqrt{x^2+6}-1} < 0$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -1)$ B) $(-1, 2)$ C) $(-\infty, 2)$ D) $(1, \infty)$ E) $(2, \infty)$

13. $\frac{8-x^3}{|x+4|} > 0$

$\Rightarrow$ S.S. = ?

A) $(2, \infty)$ B) $(-4, 2)$ C) $(-\infty, -4)$ D) $(-\infty, 2) \setminus \{-4\}$ E) $(2, 4)$

14. $x \in Z$

$\frac{(x+4)\cdot(x^2+x+7)}{(x-1)\cdot|x+3|} \leq 0$

S.S. $= \{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

15. $x \in Z$

$\frac{(x+3)\cdot|x-1|}{(x^2-4)\cdot x} < 0$

$\Rightarrow$ S.S. = ?

A) $\{1\}$ B) Ø C) Z D) $\{-3, -2, -1\}$ E) $\{1, 2\}$

16. $x \in Z$

$\frac{|x-4|-2}{|2x-6|} \leq 0$

S.S. $= \{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

1. $\left.\begin{array}{l} x+4>0 \\ 3-x>0 \end{array}\right\}$ $\Rightarrow$ S.S. = ?

A) $(-\infty, -3)$ B) $(3, \infty)$ C) $(-4, 3)$ D) $(-\infty, 3)$ E) $(-4, \infty)$

2. $\left.\begin{array}{l} \dfrac{1}{x+2}>0 \\ \dfrac{2}{x-1}<0 \end{array}\right\}$ $\Rightarrow$ S.S. = ?

A) $(-3, 2)$ B) $(1, \infty)$ C) $(-1, 2)$ D) $(-\infty, -2)$ E) $(-2, 1)$

3. $\left.\begin{array}{l} 2x+8 \geq 0 \\ x^2-x-6 \geq 0 \end{array}\right\}$ $\Rightarrow$ S.S. = ?

A) $[-3, 4]$ B) $[3, \infty)$ C) $[4, \infty)$ D) $[-4, 3]$ E) $[-4, -2] \cup [3, \infty)$

4. $\left.\begin{array}{l} x^2-9x+8<0 \\ x^2-4x+3 \geq 0 \end{array}\right\}$ $\Rightarrow$ S.S. = ?

A) $(1, 3]$ B) $[1, 8]$ C) $[8, \infty)$ D) $[3, 8)$ E) $(2, 8)$

5. $\left.\begin{array}{l} x^2-4x+3<0 \\ \dfrac{6x-1}{6}<x \end{array}\right\}$ $\Rightarrow$ S.S. = ?

A) $(-\infty, 1)$ B) $(0, 1]$ C) $(1, 3)$ D) $\varnothing$ E) R

6. $x \in Z$

$2x-2 < x^2-x \leq 3x+5$

S.S. = $\{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

7. $x \in Z$

$5-x \leq x^2+3x \leq x+15$

S.S. = $\{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 1 B) 2 C) 3 D) 4 E) 7

8. $\left.\begin{array}{l} x^2-4 \leq 0 \\ x^2-4x-5<0 \end{array}\right\}$ $\Rightarrow$ S.S. = ?

A) $(-1, 2]$ B) $[-2, 5)$ C) $(-1, 5)$ D) $(-\infty, -2) \cup [5, \infty)$ E) $\varnothing$

9. $\left.\begin{array}{l} x^2-4x<0 \\ x^2-9\geq 0 \end{array}\right\} \Rightarrow S.S.=?$

A) $[3, 0)$ B) $[3, 4)$ C) $[3, \infty)$ D) $(0, 3]$ E) $[-3, 4]$

10. $\left.\begin{array}{l} |x-2|\leq 4 \\ x^2-11x+24\leq 0 \end{array}\right\} \Rightarrow S.S.=?$

A) $[2, 4]$ B) $[3, 6]$ C) $[3, 8]$ D) $[-2, 3]$ E) $[-2, 8]$

11. $(m-1)\cdot x^2+2mx+m+3=0$

$S.S.=\{x_1, x_2\}$

$x_1<0<x_2$

$\Rightarrow ?<m<?$

A) $-2<m<0$ B) $-3<m<0$ C) $-3<m<1$ D) $3<m<1$ E) $-2<m<2$

12. $x\in Z$

$x^2+2x-8<0$

$x^2<4$

$\Rightarrow \sum x=?$

A) -2 B) -1 C) 0 D) 2 E) 4

13. $x\in Z$

$\dfrac{(2-2x)\cdot(x-5)}{x^2-6x+9}\geq 0$

$\Rightarrow \sum x=?$

A) 8 B) 10 C) 12 D) 14 E) 16

14. $\left(\frac{2}{7}\right)^{x^2-x}<\left(\frac{2}{7}\right)^{12}$

$\Rightarrow S.S.=?$

A) $R\setminus(-3, 4]$ B) $R\setminus(-3, 4)$ C) $R\setminus[-3, 4]$ D) $(-3, 4)$ E) $[-3, 4]$

15. $\dfrac{(x^2-x-12)\cdot(2x-4)^2}{(x^2+x-6)}\leq 0$

$\Rightarrow S.S.=?$

A) $(2, 4]$ B) $(-3, 2]$ C) $[4, \infty)$ D) $(-\infty, -3)\cup(-3, 2)$ E) $(-3, -2)\cup(4, \infty)$

16. $\dfrac{2}{1-x}<0$

$\dfrac{x+3}{3}>0$

$\Rightarrow S.S.=?$

A) $(1, \infty)$ B) $(1, 5)$ C) $(-1, 1)$ D) $(-\infty, 1)$ E) $(-1, 1]$

1. $x + 4 \leq 3x - 4$
$\Rightarrow$ S.S. = ?

A) $(0, 4)$ B) $(-\infty, 0)$ C) $[4, \infty)$ D) $(-4, \infty)$ E) $(2, \infty)$

2. $x^2 + 4x - 12 < 0$
$\Rightarrow$ S.S. = ?

A) $(2, 6)$ B) $(-2, 6)$ C) $(-6, 2)$ D) $(-2, 5)$ E) $(-5, 2)$

3. $x^2 < 6 - 5x$
$\Rightarrow$ S.S. = ?

A) $(1, 6)$ B) $(-1, 6)$ C) $(-6, -1)$ D) $(-6, 1)$ E) $\varnothing$

4. $3x^2 - 18x + 27 < 0$
$\Rightarrow$ S.S. = ?

A) $\{3\}$ B) $\varnothing$ C) R D) $R \setminus \{-3, 3\}$ E) $R \setminus \{3\}$

5. $(3 - x) \cdot (2x - 8) > 0$
$\Rightarrow$ S.S. = ?

A) $(3, 4)$ B) $(-4, -3)$ C) $(3, 5)$ D) $(3, 5)$ E) $(-\infty, 3] \cup (4, \infty)$

6. $x \in Z$
$(x + 7)^2 \cdot (x + 2) \cdot (7 - x) > 0$
$\Rightarrow \sum x = ?$

A) 27 B) 24 C) 22 D) 20 E) 18

7. $\dfrac{x-3}{7-x} \geq 0$
S.S. = ?

A) $(-\infty, 3)$ B) $(-3, 7]$ C) $(7, \infty)$ D) $[-7, -3]$ E) $[3, 7)$

8. $x^5 - 7x^4 < 8x^3$
$\Rightarrow$ S.S. = ?

A) $(-1, 0)$ B) $(0, \infty)$ C) $(-\infty, 0) \setminus \{-1\}$ D) $(-\infty, -1) \cup (0, 8)$ E) $(-\infty, 1) \cup (2, 8)$

9. $x \in Z$

$$\frac{x^2-7x}{(x-2)^2} < 0$$

S.S. = $\{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 8 B) 7 C) 6 D) 5 E) 4

10. $x \in Z$

$$\frac{x^2-4x-12}{(x-2)^2} \leq 0$$

S.S. = $\{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 5 B) 6 C) 7 D) 8 E) 9

11. $$\frac{(x+1)\cdot(x^2-4)}{(1-x^2)\cdot(2-x)} \leq 0$$

$\Rightarrow$ S.S. = ?

A) $[-2, 1) \setminus \{-1\}$ B) $(0, 1)$ C) $[1, 4)$ D) $(1, 2]$ E) Ø

12. $$\frac{8-2x^2}{x^2+5} \geq 0$$

$\Rightarrow$ S.S. = ?

A) $(-\sqrt{2}, 2)$ B) $[-2, \infty)$ C) $[2, \infty)$ D) $(-2, 2)$ E) $[-2, 2]$

13. $x^2 + x < 0$

$\Rightarrow$ S.S. = ?

A) $(0, \infty)$ B) $(-1, 1)$ C) $(-1, 0)$ D) $(1, \infty)$ E) $(-\infty, 0)$

14. $x \in Z$

$$\frac{x^3-4x^2+4x}{x^3-4x} \leq 0$$

S.S. = $\{x_1, x_2, ..., x_n\}$

$\Rightarrow n = ?$

A) 4 B) 3 C) 2 D) 1 E) 0

15. $$\frac{(x^2+6)\cdot(4-2x)}{x+4} \geq 0$$

$\Rightarrow$ S.S. = ?

A) $(-\infty, -4)$ B) $(2, \infty)$ C) $[-4, 2)$ D) $(-4, 2]$ E) R

16. $$\left.\begin{array}{l} x^2-x-6 < 0 \\ x^2-6x+9 > 0 \end{array}\right\} \Rightarrow \text{S.S.} = ?$$

A) $(-\infty, -2)$ B) $(-2, 3)$ C) $(3, \infty)$ D) $(-\infty, -2) \cup (3, \infty)$ E) $[-2, 3)$

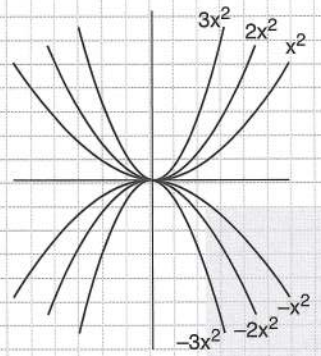
PARABOL

ÖZELLİK | Property 1

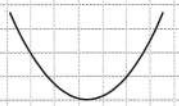
Parabol | Parabola

İkinci dereceden fonksiyon grafiğine parabol denir.

The graph of a quadratic function is called a parabola.



$f(x) = ax^2 + bx + c$

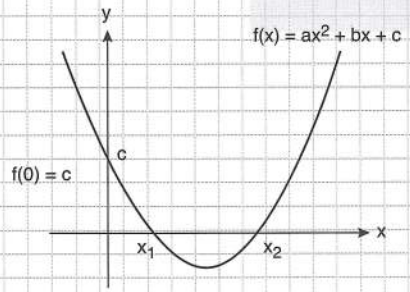
- 
  $a > 0$ ise parabolün kolları yukarı doğrudur.
  if $a > 0$ then the the vertex has the min. value

- 
  $a < 0$ ise parabolün kolları aşağıya doğrudur.
  if $a < 0$ then the vertex has the max. value.

- "a"nın mutlak değeri arttıkça parabolün kolları kapanır.
  If the rate of an absolute value of "a" increases parobola shrinks towards the vertical axis.

Kökleri Bilinen İkinci Derece Denklemi Bulma

Finding Quadratic Equations with Known Roots



$f(x_1) = 0$ $\quad$ $f(x_2) = 0$

$f(x) = a(x - x_1)(x - x_2)$

$f(0) = c$

$f(0) = a(-x_1)(-x_2)$

$c = a \cdot x_1x_2$

bu denklemden a katsayısı bulunur.

'a' factor is found from this equation.

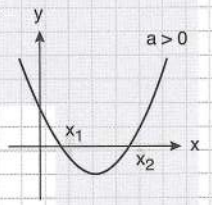
Δ'nın Durumuna Göre Paraboller

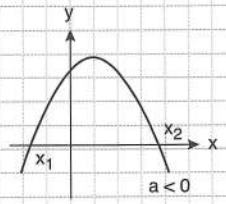
Paraboles Related to Δ's Condition

$f(x) = ax^2 + bx + c$

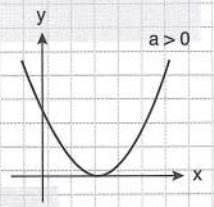
$\Delta = b^2 - 4ac$

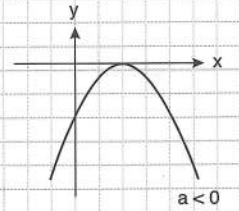
- $\Delta > 0$ ise iki farklı reel kök vardır.
  Parabol x eksenini iki farklı noktada keser.
  If $\Delta > 0$ there are two different real roots.
  Parabola cuts the x axis on two different points.



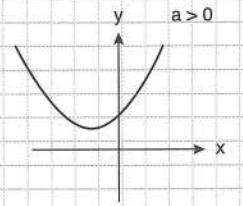


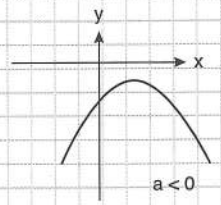
- $\Delta = 0$ ise kökler birbirine eşittir.
  Parabol x eksenine teğettir.
  If $\Delta = 0$ then the roots will be equal.
  Parabola is tangent to x axis.



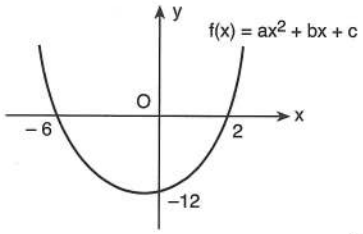


- $\Delta < 0$ ise reel kök yoktur.
  Parabol x eksenini kesmez.
  If $\Delta < 0$ there is no real root.
  Parabola will not cut the x axis.





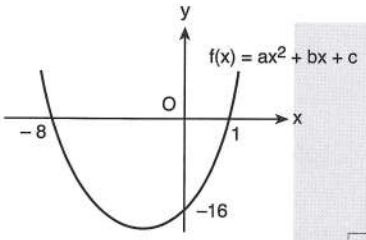
1.



⇒ f(x) = ?

$x^2 + 4x - 12$

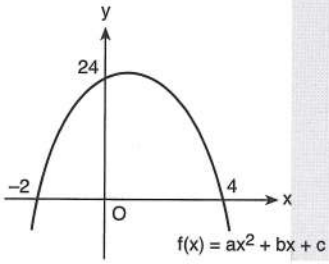
2.



⇒ f(x) = ?

$2x^2 + 14x - 16$

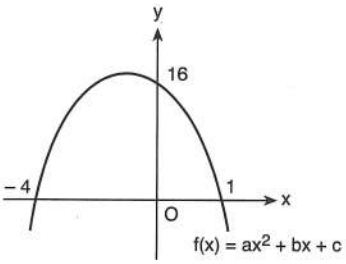
3.



⇒ f(x) = ?

$-3x^2 + 6x + 24$

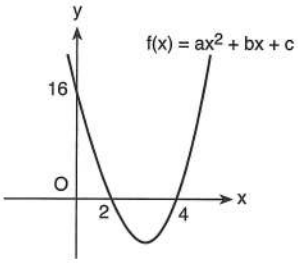
4.



⇒ f(x) = ?

$-4x^2 - 12x + 16$

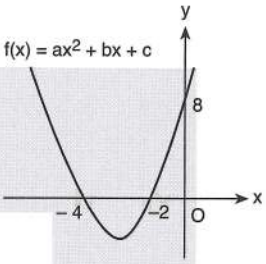
5.



⇒ f(x) = ?

$2x^2 - 12x + 16$

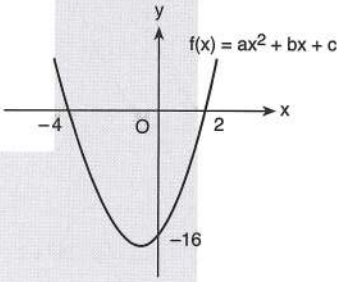
6.



⇒ f(x) = ?

$x^2 + 6x + 8$

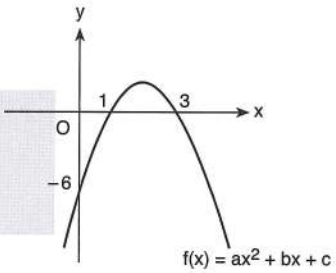
7.



⇒ f(x) = ?

$2x^2 + 4x - 16$

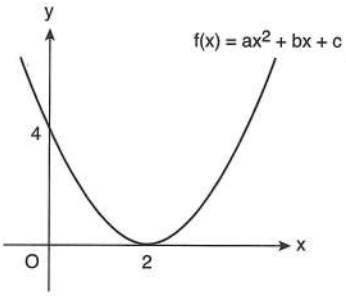
8.



⇒ f(x) = ?

$-2x^2 + 8x - 6$

9.

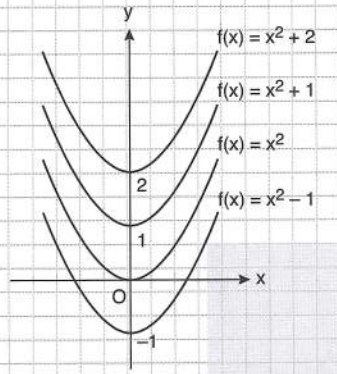


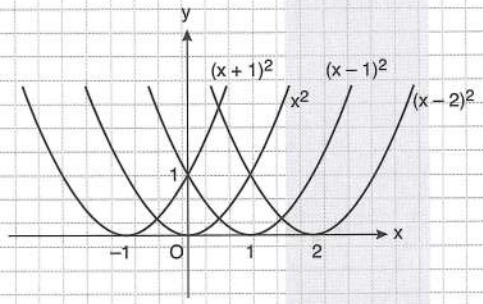
⇒ f(x) = ?

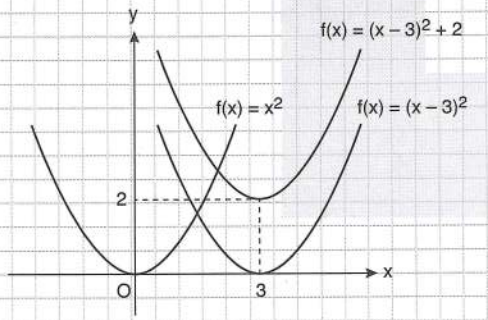
$(x - 2)^2$

ÖZELLİK | Property 2

Eksenlerde Öteleme ve Kayma
Shift and Slip in Axises





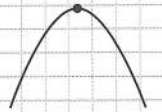


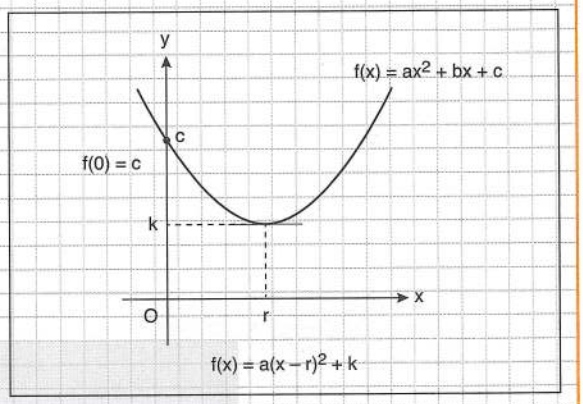
Tepe Noktasına Göre Parabolün Denklemini Bulma
Finding the Equation of Parabola by Peak

$f(x) = ax^2 + bx + c$

T(r, k)
Tepe noktası *(peak)*
$a > 0$

T(r, k)
Tepe noktası *(peak)*
$a < 0$





$f(0) = c$

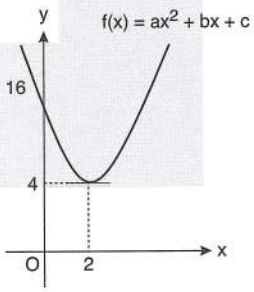
$f(0) = a(0 - r)^2 + k$

$c = a \cdot r^2 + k$

Bu denklemden a katsayısı bulunur.

'a' factor could be found in this equation.

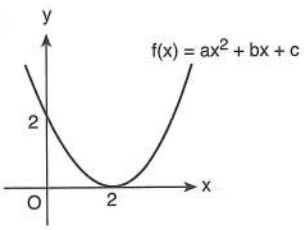
1.



$\Rightarrow f(x) = ?$

$\boxed{3(x-2)^2 + 4}$

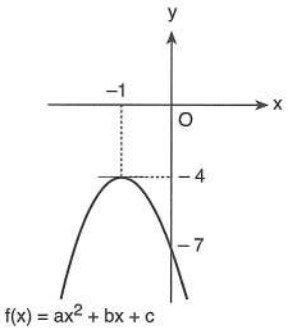
2.



$\Rightarrow f(x) = ?$

$\boxed{\frac{1}{2}(x-2)^2}$

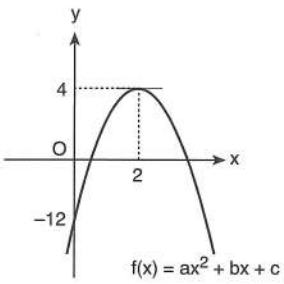
3.



$\Rightarrow f(x) = ?$

$-3(x+1)^2 - 4$

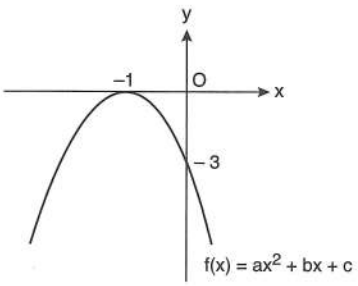
4.



$\Rightarrow f(x) = ?$

$-4x^2 + 16x - 12$

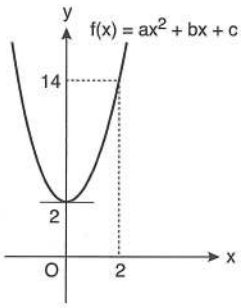
5.



$\Rightarrow f(x) = ?$

$-3(x+1)^2$

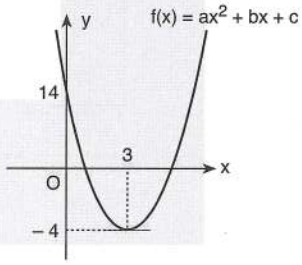
6.



$\Rightarrow f(x) = ?$

$3x^2 + 2$

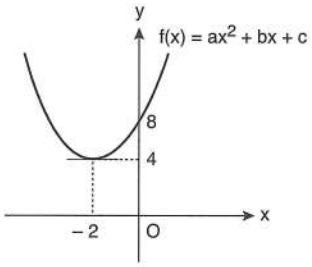
7.



$\Rightarrow f(x) = ?$

$2(x-3)^2 - 4$

8.

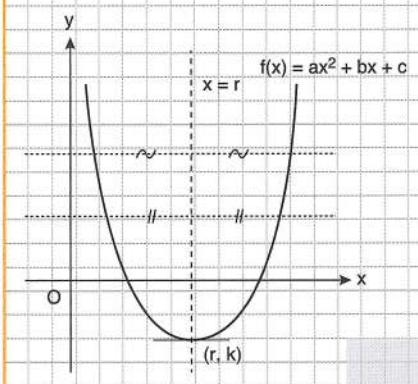


$\Rightarrow f(x) = ?$

$(x+2)^2 + 4$

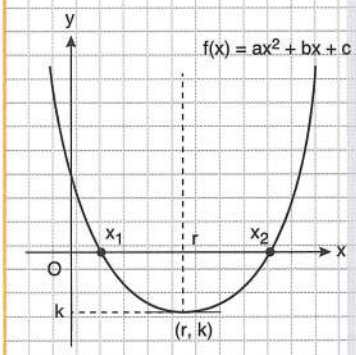
PARABOL

ÖZELLİK | Property 3



Parabol, x = r doğrusuna göre simetriktir.

Parabola is symmetrical in relation to the line x = r

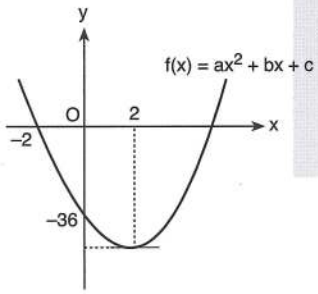


$$r = \frac{x_1 + x_2}{2}$$

$$r = \frac{-\frac{b}{a}}{2}$$

$$\boxed{r = -\frac{b}{2a} \qquad f(r) = k}$$

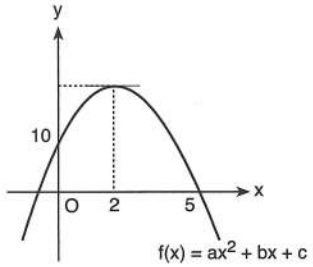
1.



⇒ f(x) = ?

$3x^2 - 12x - 36$

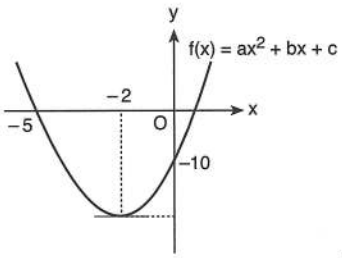
2.



⇒ f(x) = ?

$-2x^2 + 8x + 10$

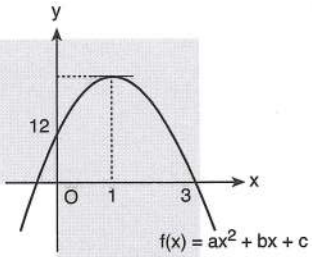
3.



⇒ f(x) = ?

$2x^2 + 8x - 10$

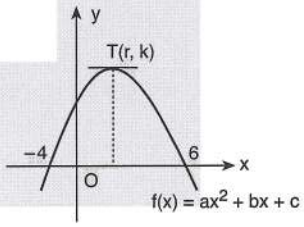
4.



⇒ f(x) = ?

$-4x^2 + 8x + 12$

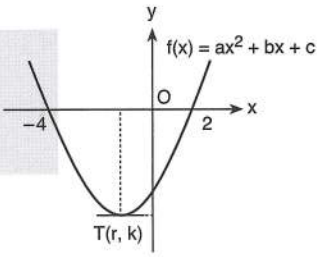
5.



⇒ r = ?

1

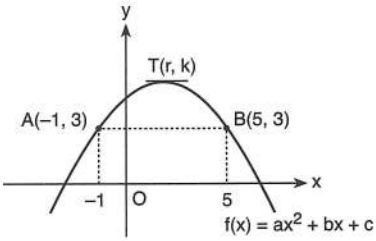
6.



⇒ r = ?

–1

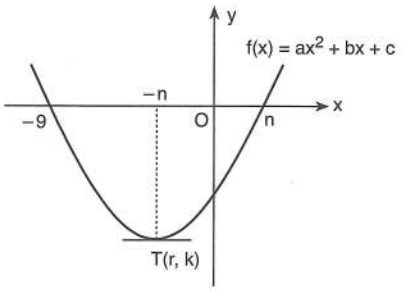
7.



⇒ r = ?

2

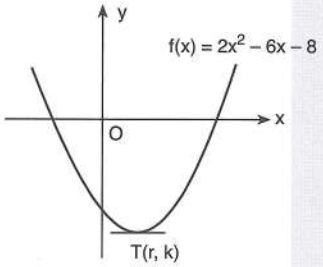
8.



⇒ r = ?

$\boxed{-3}$

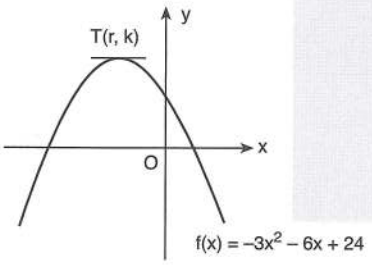
9.



⇒ r = ?

$\boxed{\frac{3}{2}}$

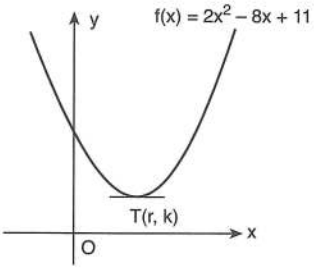
10.



⇒ k = ?

$\boxed{27}$

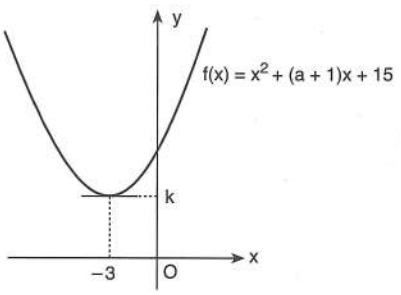
11.



⇒ k = ?

$\boxed{3}$

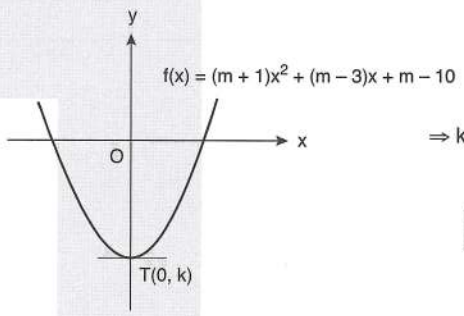
12.



⇒ k = ?

$\boxed{6}$

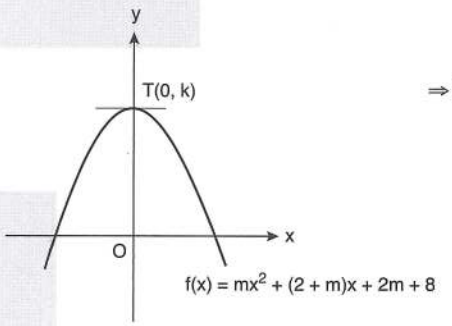
13.



⇒ k = ?

$\boxed{-7}$

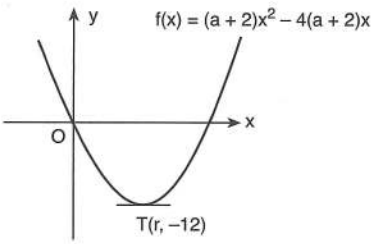
14.



⇒ k = ?

$\boxed{4}$

15.



⇒ a = ?

$\boxed{1}$

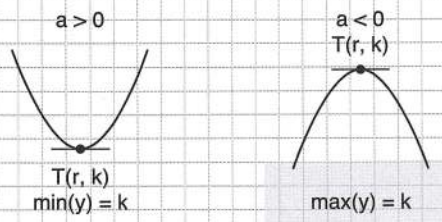
PARABOL

ÖZELLİK | Property 4

Maksimum ve Minimum Değerler
Maximum and Minimum Values

$f(x) : R \longrightarrow R$

$y = f(x) = ax^2 + bx + c$



1. $f: R \to R$

$y = f(x) = x^2 - 6x + 8$

$\Rightarrow \min(y) = ?$

$\boxed{-1}$

2. $f: R \to R$

$y = f(x) = 2x^2 - 4x + 5$

$\Rightarrow \min(y) = ?$

$\boxed{3}$

3. $f: R \to R$

$y = f(x) = -x^2 + 8x - 4$

$\Rightarrow \max(y) = ?$

$\boxed{12}$

4. $f: R \to R$

$y = f(x) = -4x^2 + 16x - 10$

$\Rightarrow \max(y) = ?$

$\boxed{6}$

5. $f: R \to R$

$y = f(x) = 2x^2 - 12x + 3$

$\Rightarrow \min(y) = ?$

$\boxed{-15}$

6. $f: R \to R$

$y = f(x) = 4x^2 - 16x + 5$

$\Rightarrow \min(y) = ?$

$\boxed{-11}$

7. $f: R \to R$

$y = f(x) = -x^2 - 3x + 1$

$\Rightarrow \max(y) = ?$

$\boxed{\frac{13}{4}}$

8. $f: R \to R$

$y = f(x) = 2x^2 + 5x + 10$

$\Rightarrow \min(y) = ?$

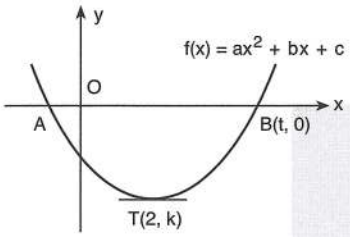
$\boxed{\frac{55}{8}}$

ÖZELLİK | Property 5

Paraboller simetrik olduğundan doğru parçalarınının uzunluklarına göre noktaların koordinatları belirlenir.

As parabolas are symmetrical, the coordinates of the points will be determind by the lenght of the parts of the line.

1.

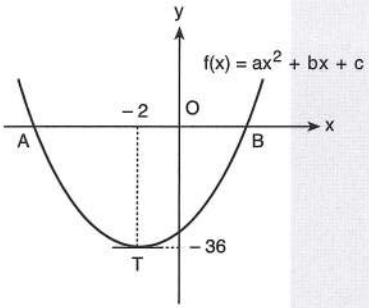


$5|AO| = |OB|$

$\Rightarrow t = ?$

5

2.

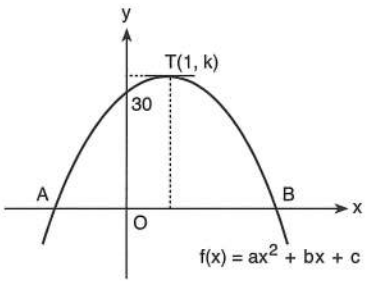


$2|OB| = |OA|$

$\Rightarrow f(x) = ?$

$x^2 + 4x - 32$

3.

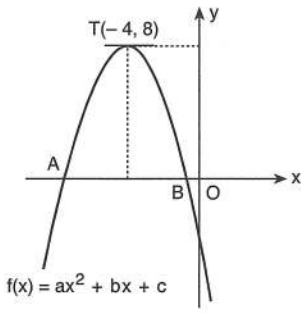


$5|AO| = 3|OB|$

$\Rightarrow f(x) = ?$

$-2x^2 + 4x + 30$

4.

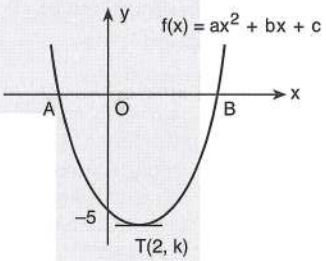


$3|OB| = |AO|$

$\Rightarrow f(x) = ?$

$-2x^2 - 16x - 24$

5.

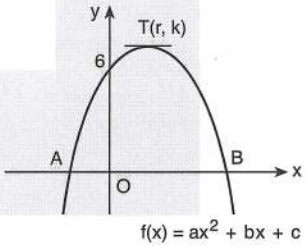


$|B - A| = 6$ br

$\Rightarrow k = ?$

– 9

6.



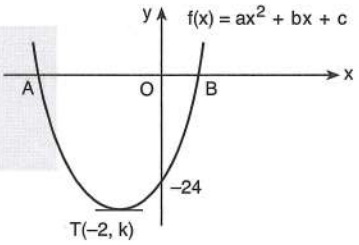
$|B - A| = 5$ br

$r = \frac{1}{2}$

$\Rightarrow f(x) = ?$

$-x^2 + x + 6$

7.

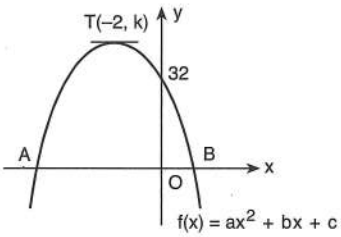


$|B - A| = 8$ br

$\Rightarrow k = ?$

– 32

8.



$|B - A| = 12$ br

$\Rightarrow k = ?$

36

ÖZELLİK | Property 6

Bir Parabolün Bir Doğruya Göre Durumları
Conditions of Parabola in Relation to a Line

$y = ax^2 + bx + c$

$y = mx + n$

Ortak çözüm yapılır. *(Joint solutions are made)*

$$ax^2 + bx + c = mx + n$$

$$ax^2 + (b - m)x + c - n = 0$$

Δ diskriminantı incelenir. *(Discrement of Δ is analyzed)*

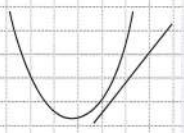
- $\Delta > 0$

Doğru, denklemi iki noktada keser.
Line cuts the equation in two points.

- $\Delta = 0$

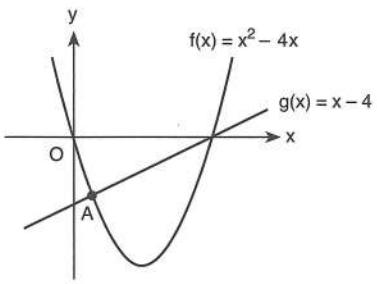
Doğru, parabole teğettir.
Line is tangent to parabola.

- $\Delta < 0$



Doğru, parabolü kesmez.
Line does not cut the parabola.

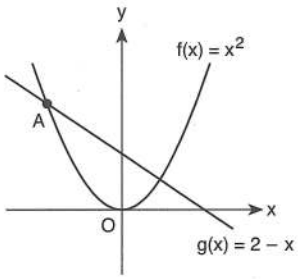
1.



⇒ A = ?

(1, – 3)

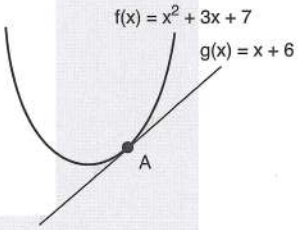
2.



⇒ A = ?

(– 2, 4)

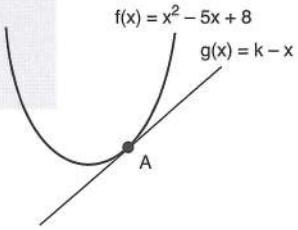
3.



⇒ A = ?

(–1, 5)

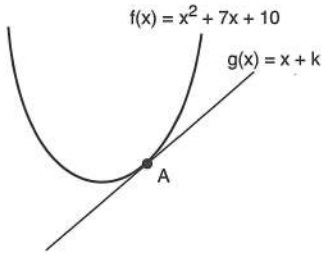
4.



⇒ k = ?

4

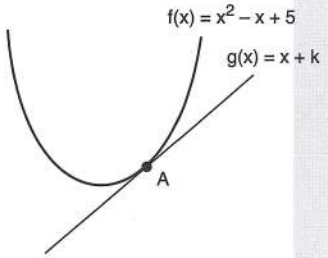
5.



$\Rightarrow k = ?$

$\boxed{1}$

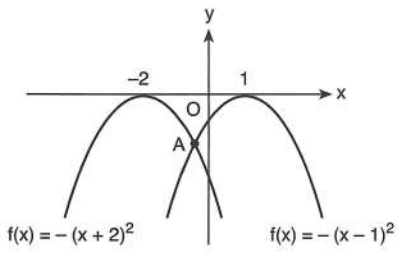
6.



$\Rightarrow A = ?$

$\boxed{(1, 5)}$

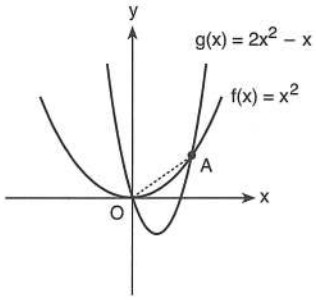
7.



$\Rightarrow A = ?$

$\boxed{\left(-\frac{1}{2}, -\frac{9}{4}\right)}$

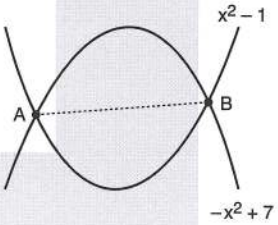
8.



$\Rightarrow |OA| = ?$

$\boxed{\sqrt{2}}$

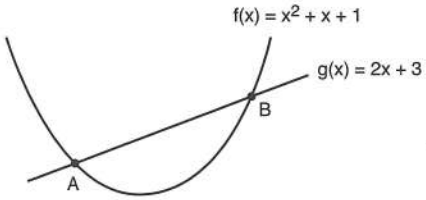
9.



$\Rightarrow |AB| = ?$

$\boxed{4}$

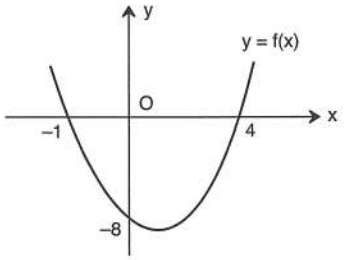
10.



$\Rightarrow |AB| = ?$

$\boxed{3\sqrt{5}}$

1.

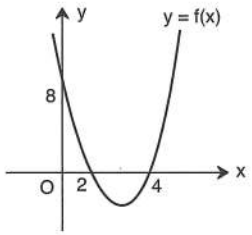


$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $x^2 - 4x - 4$
B) $2x^2 - 6x + 8$
C) $2x^2 - 8x - 8$
D) $2x^2 - 6x - 8$
E) $x^2 - 3x - 4$

2.

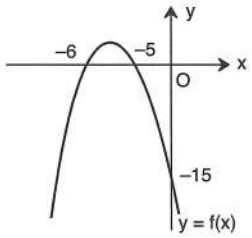


$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $2x^2 - 12x - 16$
B) $x^2 - 2x + 4$
C) $x^2 - 6x - 8$
D) $x^2 - 6x + 8$
E) $x^2 + 6x + 8$

3.

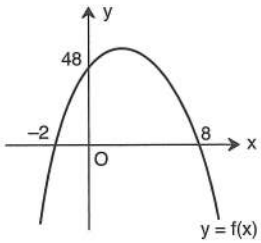


$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $x^2 + 11x + 30$
B) $-x^2 - 11x - 30$
C) $\dfrac{x^2 + 11x + 30}{2}$
D) $\dfrac{x^2 + 11x + 30}{-2}$
E) $-x^2 + x + 30$

4.

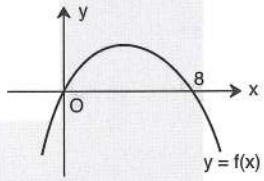


$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $-3x^2 + 18x + 48$
B) $-2x^2 + 48$
C) $\dfrac{-x^2}{2} - 90x + 32$
D) $3x^2 - 18x + 48$
E) $2x^2 + 16$

5.



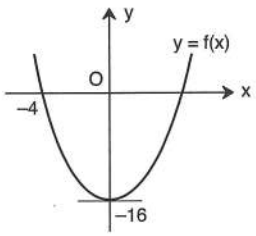
$f(x) = ax^2 + bx + c$

$f(1) = 7$

$\Rightarrow f(x) = ?$

A) $x^2 - 6x$
B) $8x - x^2$
C) $2x^2 + 12x$
D) $2x^2 - 12x$
E) $x^2 - 4$

6.

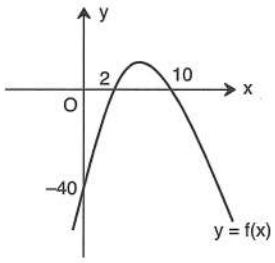


$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $x^2 - 4$
B) $2x^2 - 16$
C) $x^2 + 16$
D) $x^2 - 16$
E) $-x^2 + 16$

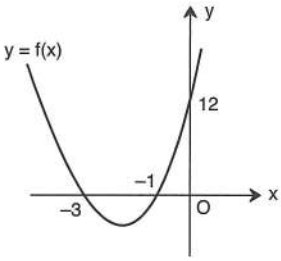
7.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $-2x^2 - 12x + 20$
B) $-x^2 - 12x + 20$
C) $\frac{x^2 - 12x - 20}{2}$
D) $x^2 - 12x - 20$
E) $-2x^2 + 24x - 40$

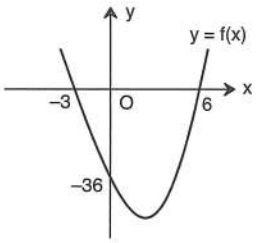
8.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $4x^2 + 16x + 12$
B) $x^2 + 4x + 3$
C) $4x^2 - 16x + 12$
D) $x^2 - 4x - 3$
E) $12(x^2 + 4x + 3)$

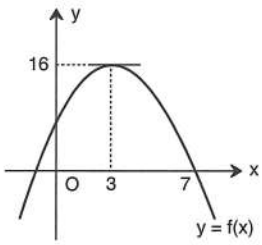
9.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $x^2 - 4x - 12$
B) $2x^2 - 6x - 36$
C) $x^2 - 4x + 12$
D) $3x^2 - 12x - 36$
E) $3x^2 + 12x + 36$

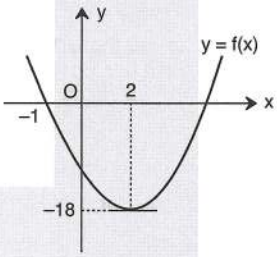
10.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $x^2 - 6x - 7$
B) $-x^2 - 6x + 7$
C) $-x^2 + 6x + 7$
D) $-x^2 + 6x - 7$
E) $-x^2 - 6x - 7$

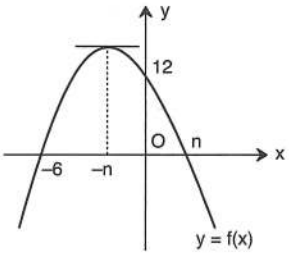
11.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $2x^2 - 8x - 10$
B) $x^2 - 4x - 5$
C) $x^2 - 8x - 5$
D) $2x^2 - 16x - 10$
E) $(x - 2)^2 - 12$

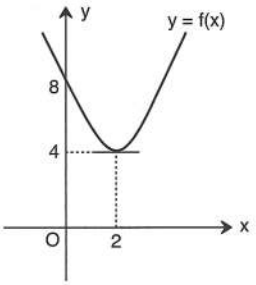
12.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $x^2 + 4x - 12$
B) $-x^2 - 4x + 12$
C) $x^2 + 2x - 6$
D) $-x^2 - 2x + 6$
E) $-x^2 - 8x + 24$

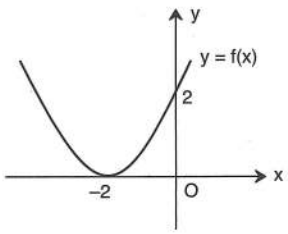
1.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $(x-2)^2 + 4$
B) $2(x+2)^2 + 4$
C) $(x+2)^2 - 4$
D) $(x-8)^2 + 4$
E) $-(x-2)^2 + 4$

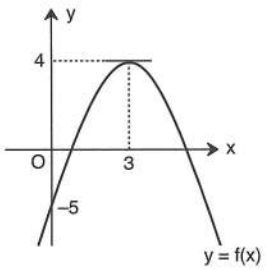
2.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $(x+2)^2$
B) $x^2 - 2x$
C) $(x+2)^2 + 2$
D) $\frac{(x+2)^2}{2}$
E) $x^2 + 2x$

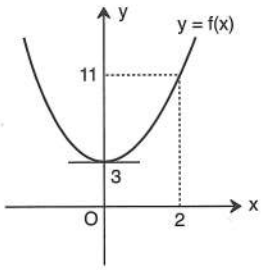
3.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $(x+3)^2 - 4$
B) $-(x-3)^2 + 4$
C) $-(x+3)^2 - 4$
D) $-(x+3)^2 + 4$
E) $-2(x+3)^2 + 4$

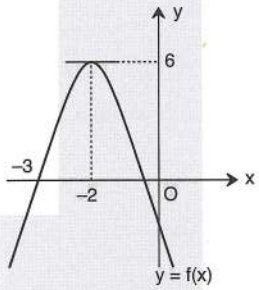
4.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $x^2 + 3$
B) $x^2 - 3$
C) $2x^2 + 3$
D) $2x^2 - 3$
E) $3x^2 - 2$

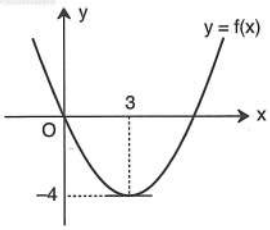
5.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $(x+2)^2 - 6$
B) $(x-2)^2 - 6$
C) $(x-2)^2 + 6$
D) $-6(x-2)^2 - 6$
E) $-6(x+2)^2 + 6$

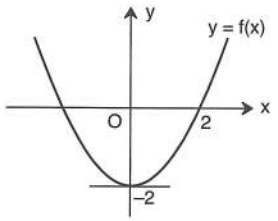
6.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $(x-2)^2 + 4$
B) $-(x-2)^2 - 4$
C) $(x+2)^2 - 4$
D) $(x-2)^2 - 4$
E) $\frac{4}{9}(x-3)^2 - 4$

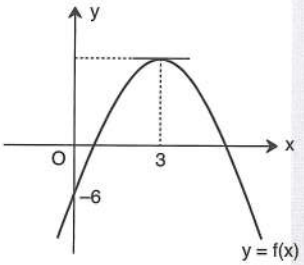
7.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $2x^2 + 2$ B) $2x^2 - 2$ C) $\frac{1}{2}x^2 - 2$
D) $\frac{1}{2}x^2 + 2$ E) $x^2 - 2$

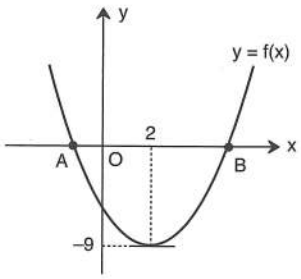
8.



$f(x) = ax^2 + bx + c$
$f(1) = -1$
$\Rightarrow f(x) = ?$

A) $-x^2 + 6x + 12$ B) $-x^2 - 3x - 6$
C) $-x^2 + 6x - 12$ D) $-x^2 + 6x - 6$
E) $-x^2 + 3x - 6$

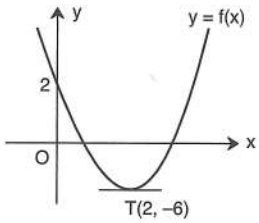
9.



$f(x) = ax^2 + bx + c$
$|AB| = 6$ br
$\Rightarrow f(x) = ?$

A) $x^2 - 4x - 5$ B) $x^2 + 2x - 5$
C) $-x^2 + 4x + 5$ D) $-x^2 - 2x + 5$
E) $x^2 - 2x - 6$

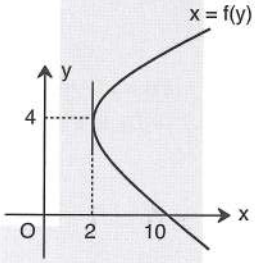
10.



$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $(x + 2)^2 + 6$ B) $(x - 2)^2 + 6$
C) $2(x + 2)^2 + 6$ D) $2(x - 2)^2 - 6$
E) $2(x - 2)^2 + 6$

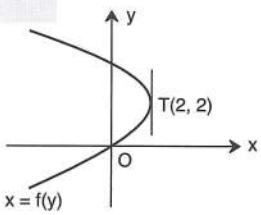
11.



$f(y) = a(y - b)^2 + c$
$\Rightarrow f(y) = ?$

A) $2(y + 2)^2 + 4$ B) $(y + 2)^2 - 4$
C) $(y - 2)^2 - 4$ D) $(y - 4)^2 + 4$
E) $\frac{1}{2}(y - 4)^2 + 2$

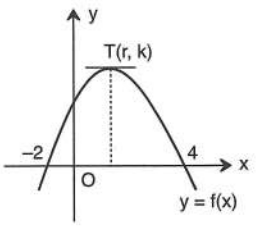
12.



$f(y) = a(y - b)^2 + c$
$\Rightarrow f(y) = ?$

A) $-\frac{1}{2}(y - 2)^2 + 4$ B) $-(y - 2)^2 + 4$
C) $-\frac{1}{2}(y - 2)^2 + 2$ D) $2(y - 2)^2 - 4$
E) $(y - 2)^2 + 2$

1.

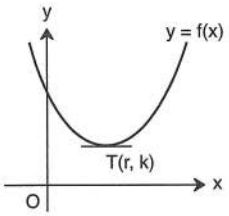


$f(x) = ax^2 + bx + c$

$\Rightarrow r = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

2.

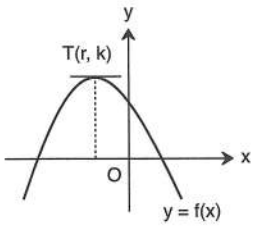


$f(x) = x^2 - 4x + 6$

$\Rightarrow T(r, k) = ?$

A) (2, 2) B) (2, 6) C) (2, 10) D) (4, 6) E) (4, 10)

3.

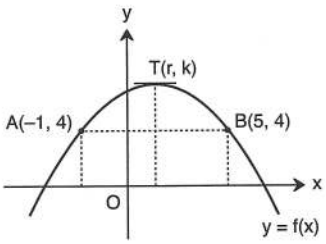


$f(x) = -x^2 - 6x + 1$

$\Rightarrow T(r, k) = ?$

A) (–2, 3) B) (–2, 1) C) (–3, 10) D) (–6, 6) E) (–6, 12)

4.

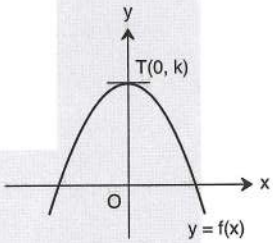


$f(x) = ax^2 + bx + c$

$\Rightarrow r = ?$

A) 1 B) $\frac{3}{2}$ C) 2 D) $\frac{5}{2}$ E) 3

5.

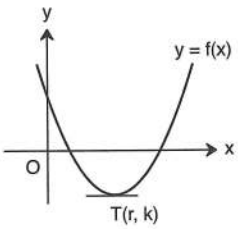


$f(x) = -ax^2 - (a - 5)x + 4a$

$\Rightarrow k = ?$

A) 10 B) 15 C) 16 D) 20 E) 22

6.



$f(x) = 2ax^2 - 4ax + 8$

$\Rightarrow r = ?$

A) $\frac{3}{21}$ B) 1 C) 2 D) $\frac{7}{3}$ E) 4

7. $f: R \to R$

$y = f(x) = x^2 - 4x + 11$

$\Rightarrow \min(y) = ?$

A) 7 B) 6 C) 5 D) 3 E) 2

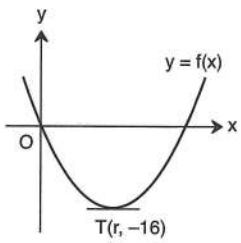
8. $f: R \to R$

$y = f(x) = -x^2 + 6x - 9$

$\Rightarrow \max(y) = ?$

A) 2 B) 1 C) 0 D) –3 E) –9

9.

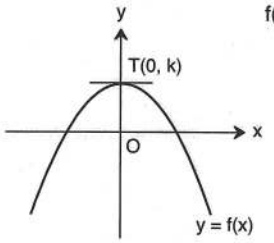


$f(x) = (a + 1)x^2 - 4(a + 1)x$

$\Rightarrow a = ?$

A) 5 B) $\frac{9}{2}$ C) 4 D) $\frac{7}{2}$ E) 3

10.

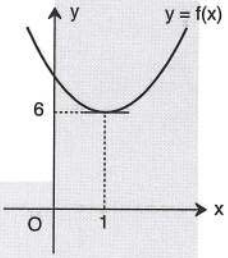


$f(x) = mx^2 + (m + 4)x - 2m + 1$

$\Rightarrow k = ?$

A) 2 B) 5 C) 7 D) 8 E) 9

11.

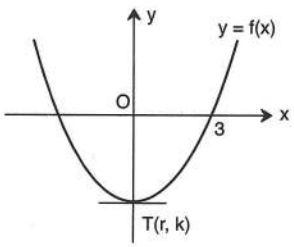


$f(x) = (a + 1)x^2 - 4ax - a + 9$

$\Rightarrow a = ?$

A) 6 B) 5 C) 3 D) 2 E) 1

12.



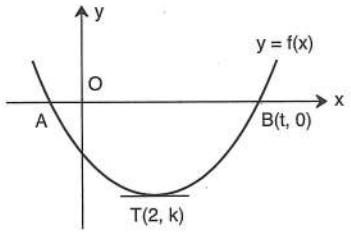
$f(x) = x^2 + ax + b$

$f(2) = -5$

$\Rightarrow T(r, k) = ?$

A) (0, –5) B) (0, –6) C) (0, –7) D) (0, –8) E) (0, –9)

1.



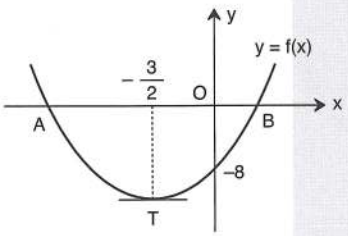
$f(x) = ax^2 + bx + c$

$2 \cdot |AO| = |OB|$

$\Rightarrow t = ?$

A) 3 B) 4 C) 5 D) 6 E) 8

2.



$f(x) = ax^2 + bx + c$

$|AO| = 4 \cdot |OB|$

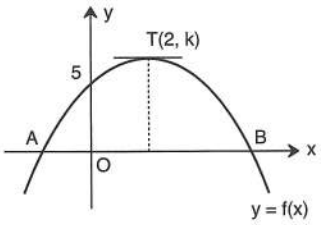
$\Rightarrow f(x) = ?$

A) $x^2 - 2x - 3$ B) $2x^2 - 4x - 6$

C) $2x^2 + 6x - 8$ D) $x^2 + 6x - 8$

E) $4x^2 - 12x + 8$

3.



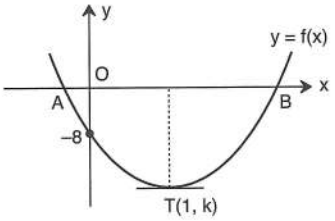
$f(x) = ax^2 + bx + c$

$5 \cdot |AO| = |OB|$

$\Rightarrow k = ?$

A) 10 B) 9 C) 8 D) 7 E) 6

4.



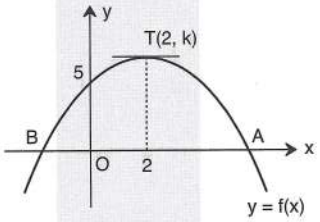
$f(x) = ax^2 + bx + c$

$|B - A| = 6$ br

$\Rightarrow k = ?$

A) –9 B) –10 C) –12 D) –16 E) –20

5.



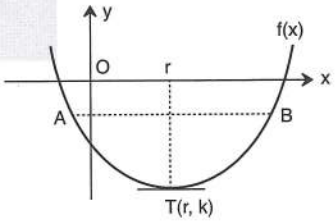
$f(x) = ax^2 + bx + c$

$|A - B| = 6$ br

$\Rightarrow k = ?$

A) 6 B) 8 C) 9 D) 11 E) 12

6.



$f(x) = ax^2 + bx + c$

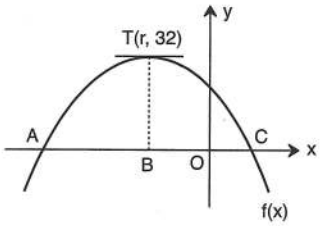
$A(-1, n)$

$|B - A| = 10$ br

$\Rightarrow r = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

7.

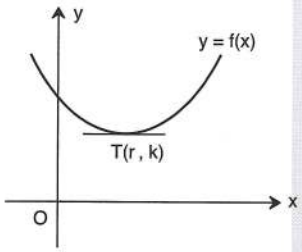


$f(x) = mx^2 + 4mx + 24$

$\Rightarrow m = ?$

A) -8 B) -2 C) 2 D) 4 E) 8

8.



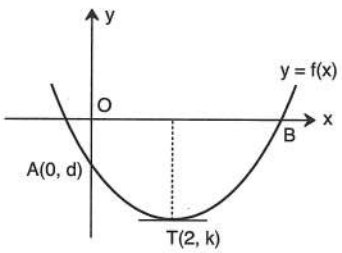
$f(x) = x^2 - (m + 2)x + 9$

$m \in Z$

$\Rightarrow \max(m) + \min(m) = ?$

A) -4 B) -2 C) 2 D) 1 E) 0

9.

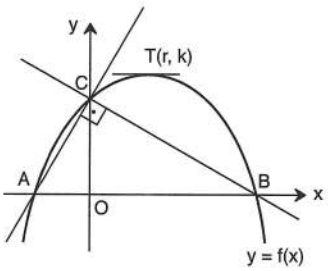


$f(x) = ax^2 - 12x - 9$

$\Rightarrow a + d = ?$

A) -9 B) -8 C) -7 D) -6 E) -2

10.



$f(x) = ax^2 + bx + c$

$[AC] \perp [BC]$

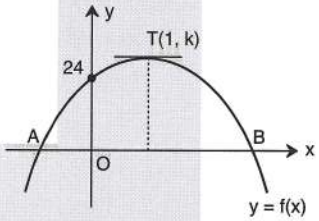
$|OB| = 9 \cdot |AO|$

$|OC| = 3$ br

$\Rightarrow r = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

11.



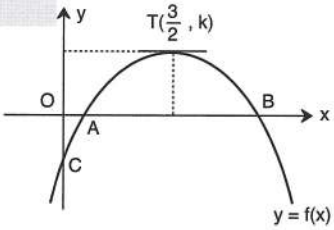
$f(x) = ax^2 + bx + c$

$2 \cdot |OB| = 3 \cdot |AO|$

$\Rightarrow k = ?$

A) 25 B) 26 C) 27 D) 28 E) 29

12.



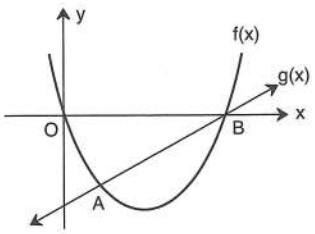
$f(x) = -x^2 + ax + b$

$2 \cdot |OA| = |OB|$

$\Rightarrow k = ?$

A) $-\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) 1 E) 2

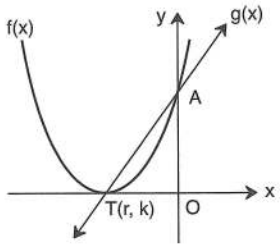
1.



$g(x) = x - 2$
$f(x) = x^2 - 2x$
$\Rightarrow A = ?$

A) (2, –1) B) (1, –1) C) $\left(\frac{3}{2}, -\frac{1}{2}\right)$ D) (2, –2) E) $\left(\frac{3}{2}, -2\right)$

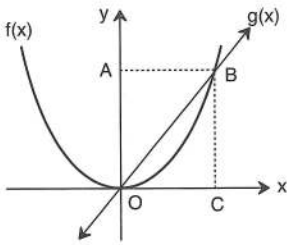
2.



$g(x) = 2x + 6$
$f(x) = ax^2 + bx + c$
$\Rightarrow f(x) = ?$

A) $(x + 3)^2 - 6$ B) $(x + 3)^2 + 6$ C) $\frac{1}{3}(x+3)^2 - 6$ D) $\frac{2}{3}(x+3)^2$ E) $\frac{2}{3}(x-3)^2 - 6$

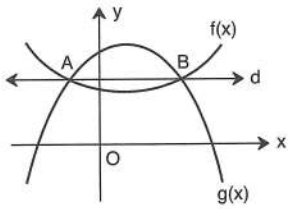
3.



$g(x) = 3x$
$f(x) = x^2$
ABCO dikdörtgen
ABCO rectangle
$\Rightarrow A(ABCO) = ?$

A) 6 B) 8 C) 9 D) 12 E) 27

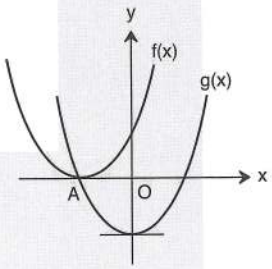
4.



$f(x) = x^2 - 2x + 2$
$g(x) = -x^2 + 2x + 8$
$d: ax + by + c = 0$
$\Rightarrow d = ?$

A) $y - 5 = 0$ B) $x - y - 5 = 0$ C) $2x - y - 1 = 0$ D) $x + y + 2 = 0$ E) $x - 5 = 0$

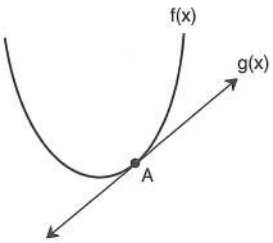
5.



$f(x) = x^2 + 4x + 4$
$g(x) = ax^2 - 4$
$\Rightarrow a = ?$

A) –2 B) –1 C) 1 D) 2 E) 4

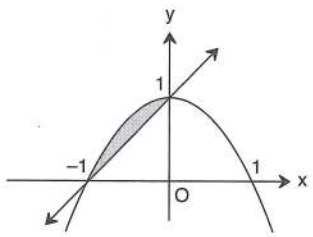
6.



$g(x) = x + 1$
$f(x) = x^2 + 7x + n$
$\Rightarrow n = ?$

A) 10 B) 9 C) 8 D) 7 E) 6

7.

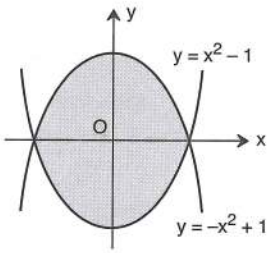


Aşağıdaki eşitsizlik sistemlerinden hangisi taralı alanı verir?

Which of the following inequality system gives the shaded area?

A) $y \geq x + 1$, $y \geq -x^2 + 1$
B) $y \geq x + 1$, $y \leq -x^2 + 1$
C) $y \leq x + 1$, $y \leq x^2 - 1$
D) $y \geq x + 1$, $y \leq x^2 - 1$
E) $y \geq x - 1$, $y \leq -x^2 + 1$

8.

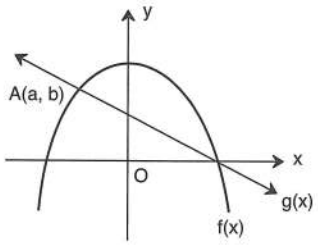


Aşağıdaki eşitsizlik sistemlerinden hangisi taralı alanı verir?

Which of the following inequality system gives the shaded area?

A) $y \leq -x^2 + 1$, $y > x^2 - 1$
B) $y \leq -x^2 + 1$, $y \geq x^2 - 1$
C) $y > x^2 - 1$, $y < -x^2 + 1$
D) $y \leq -x^2 + 1$, $y \geq x^2 + 1$
E) $y \leq x^2 - 1$, $y \geq -x^2 + 1$

9.



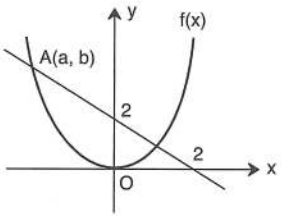
$f(x) = -x^2 - x + 12$

$g(x) = 3 - x$

$\Rightarrow A(a, b) = ?$

A) (0, 3)
B) (–2, 5)
C) (–3, 6)
E) (–1, 4)
E) (–4, 7)

10.

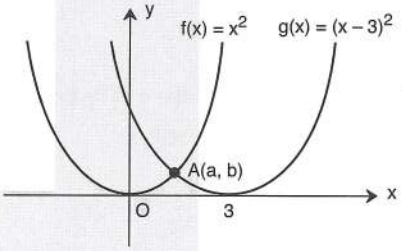


$f(x) = x^2$

$\Rightarrow a + b = ?$

A) 3
B) 2
C) 1
D) –1
E) –2

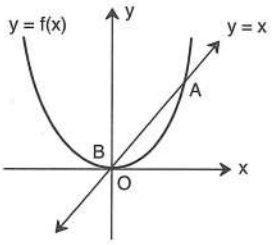
11.



$\Rightarrow A(a, b) = ?$

A) $\left(\frac{1}{2}, \frac{1}{4}\right)$
B) $\left(\frac{3}{2}, \frac{9}{4}\right)$
C) $\left(\frac{1}{4}, \frac{1}{16}\right)$
D) (2, 4)
E) (1, 1)

12.

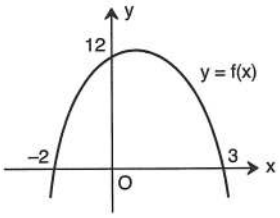


$f(x) = 2x^2$

$\Rightarrow |AB| = ?$

A) $\frac{1}{2}$
B) $\frac{\sqrt{2}}{2}$
C) $\sqrt{2}$
D) 2
E) $2\sqrt{2}$

1.

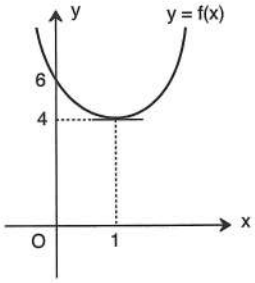


$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $-2x^2 + 2x + 12$
B) $-x^2 + x - 6$
C) $x^2 - x - 6$
D) $-x^2 + 2x - 6$
E) $x^2 - x - 6$

2.



$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $(x - 1)^2 + 4$
B) $(x + 1)^2 - 4$
C) $(x - 1)^2 - 4$
D) $2(x - 1)^2 + 4$
E) $2(x - 1)^2 - 4$

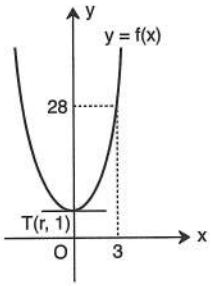
3. $f: R \to R$

$y = f(x) = 2x^2 - 4x + 5$

$\Rightarrow \min(y) = ?$

A) 1 B) 3 C) 5 D) 6 E) 8

4.

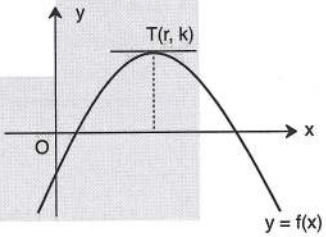


$f(x) = ax^2 + bx + c$

$\Rightarrow f(x) = ?$

A) $3x^2 + 1$
B) $(x + 1)^2 + 3$
C) $(x - 1)^2 + 28$
D) $x^2 + 1$
E) $(x - 1)^2 + 3$

5.

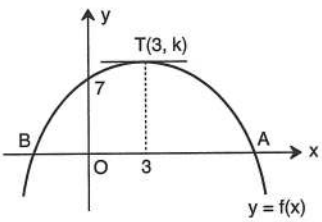


$f(x) = -2x^2 + 8x - 1$

$\Rightarrow r + k = ?$

A) 2 B) 3 C) 4 D) 7 E) 9

6.



$f(x) = ax^2 + bx + c$

$|A - B| = 8$ br

$\Rightarrow k = ?$

A) 18 B) 16 C) 14 D) 10 E) 8

7. $f: R \to R$

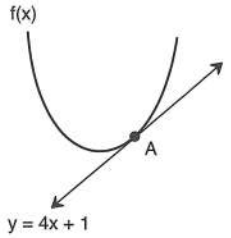
$y = f(x) = m \cdot x^2 + 2m \cdot x + (1 - m)$

$\max(y) = 5$

$\Rightarrow m = ?$

A) -3 B) -2 C) -1 D) 0 E) 1

8.

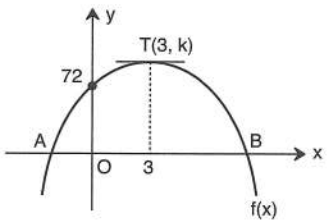


$f(x) = 2x^2 - 2x + m$

$\Rightarrow m = ?$

A) $-\frac{9}{2}$ B) $-\frac{5}{2}$ C) 2 D) 4 E) $\frac{11}{2}$

9.



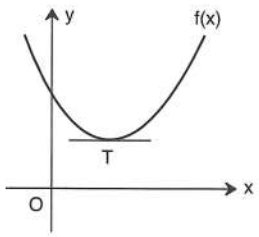
$f(x) = ax^2 + bx + c$

$|OB| = 2 \cdot |AO|$

$\Rightarrow k = ?$

A) 81 B) 82 C) 83 D) 84 E) 85

10.



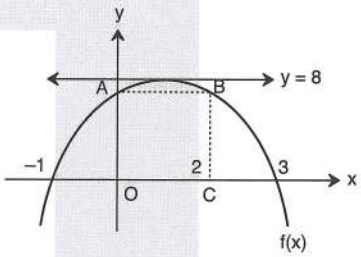
$f(x) = x^2 - (2m - 4)x + 16$

$m \in Z$

$\Rightarrow \max(m) = ?$

A) 3 B) 4 C) 5 D) 6 E) 8

11.

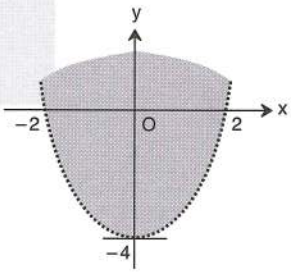


$f(x) = ax^2 + bx + c$

$\Rightarrow A(ABCO) = ?$

A) 12 B) 10 C) 8 D) 6 E) 4

12.



Aşağıdaki eşitsizliklerden hangisi taralı alanı verir?

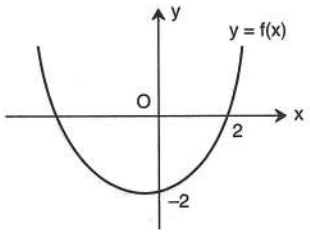
Which of the following inequality gives the shaded area?

A) $y > x^2 - 2$ B) $y \geq x^2 - 2$

C) $y > x^2 - 4$ D) $y < x^2 - 4$

E) $y < 2x^2 - 4$

1.

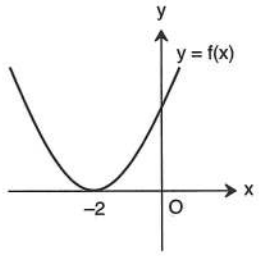


$f(x) = x^2 + mx + n$

$\Rightarrow m \cdot n = ?$

A) –2 B) –1 C) 1 D) 2 E) 4

2.

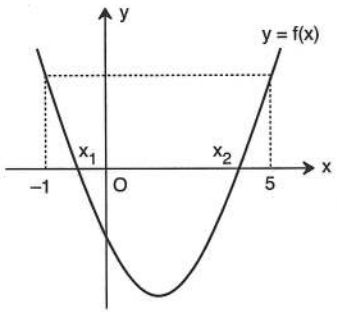


$f(x) = ax^2 + bx + 8$

$\Rightarrow a \cdot b = ?$

A) 8 B) 10 C) 12 D) 16 E) 20

3.

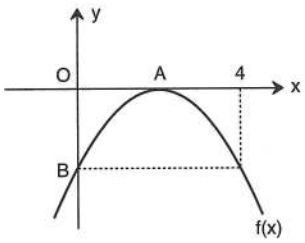


$f(x) = ax^2 + bx + c$

$\Rightarrow x_1 + x_2 = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

4.



$f(x) = ax^2 + bx + c$

$2 \cdot |OB| = |OA|$

$\Rightarrow f(x) = ?$

A) $y = (x-2)^2$ B) $y = 4(x-2)^2$

C) $y = -(x-2)^2$ D) $y = -4(x-2)^2$

E) $y = -\frac{1}{4}(x-2)^2$

5. $x, y \in R$

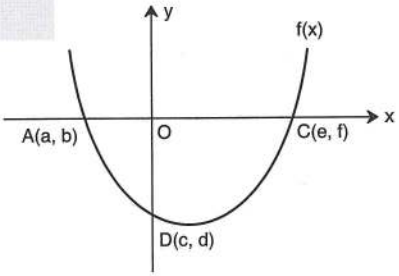
$A = 3y^2 + 12y + 5$

$B = -x^2 - 10x + 8$

$\Rightarrow \min(A - B) = ?$

A) –45 B) –40 C) –35 D) –30 E) –19

6.

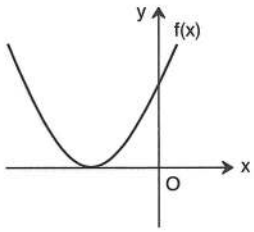


$f(x) = (x + 3) \cdot (x - 2)$

$\Rightarrow a \cdot e \cdot d = ?$

A) –36 B) –12 C) –6 D) 12 E) 36

7.

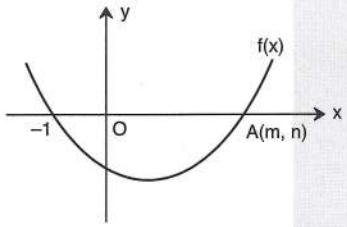


$f(x) = x^2 - ax + 1$

$\Rightarrow a = ?$

A) –1 B) –2 C) –3 D) –4 E) –5

8.

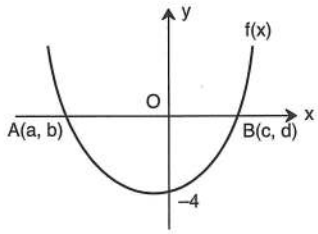


$f(x) = ax^2 + x - 2$

$\Rightarrow m = ?$

A) 1 B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) $\frac{5}{2}$ E) $\frac{7}{2}$

9.

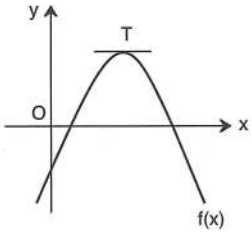


$f(x) = x^2 - 3x + n$

$\Rightarrow a + b + c + d = ?$

A) –5 B) –3 C) 1 D) 3 E) 5

10.



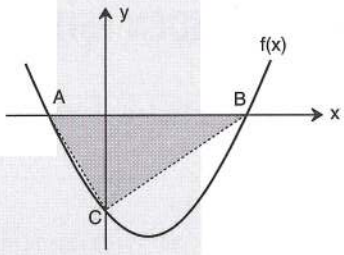
$f(x) = ax^2 + bx + c$

Aşağıdakilerden hangisi kesinlikle yanlıştır?

Which of the following is absolutely wrong?

A) $ab < 0$ B) $b > 0$ C) $a < b$ D) $b^2 < 4ac$ E) $bc < 0$

11.

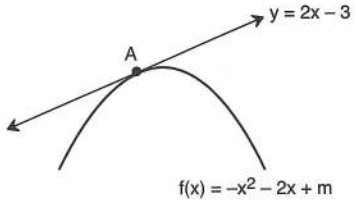


$f(x) = x^2 - 4x - 5$

$\Rightarrow A(ABC) = ?$

A) 12 B) 15 C) 18 D) 20 E) 25

12.



$\Rightarrow m = ?$

A) 4 B) 1 C) –1 D) –4 E) –7

YANIT ANAHTARI | ANSWER KEY

II. DERECEDEN DENKLEMLER QUADRATIC EQUATIONS

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	E	C	E	C	D	E	C	C	D	E	C	B	E	A	B

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	A	E	B	A	C	E	E	B	E	E	E	E	C	A	E

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	D	E	D	E	E	B	C	E	D	C	B	E	C	B	A

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	D	C	D	D	A	E	B	A	E	C	C	C	A	E

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	E	D	E	B	D	E	E	C	E	C	D	C	E	B

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	E	C	A	C	E	A	A	C	E	C	C	D	C	D	E

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	A	A	C	B	B	D	B	E	C	C	D	B	A	E	C

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	C	E	C	E	A	B	A	E	B	A	E	D	E	A	A

II. DERECEDEN EŞİTSİZLİKLER QUADRATIC INEQUATIONS

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	D	B	C	C	D	A	A	C	E	E	C	C	C	E

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	C	B	D	A	C	E	D	D	E	E	E	B	C	D	B

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	B	B	B	A	C	E	E	B	E	C	D	C	B	D

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	E	D	C	D	C	A	B	B	C	C	C	C	A	A

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	C	D	B	A	D	E	D	D	D	A	E	C	C	D	B

PARABOL PARABOLA

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12
D	D	D	A	B	D	E	A	B	C	A	B

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12
A	D	B	C	E	E	C	D	A	D	E	C

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12
E	A	C	C	D	B	A	C	E	E	E	E

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12
E	C	B	A	C	D	B	C	D	C	A	C

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12
B	D	E	A	C	A	B	B	C	B	B	B

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12
A	D	B	A	E	B	B	E	A	C	A	C

TEST 7

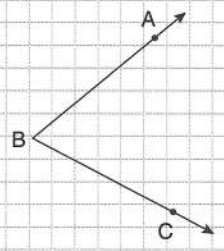
1	2	3	4	5	6	7	8	9	10	11	12
D	D	D	E	B	E	B	B	D	D	B	E

TRİGONOMETRİ

TRIGONOMETRY

ÖZELLİK | Property 1

Açı | Angle



$\widehat{ABC}$ açısı

$\widehat{CBA}$ açısı

$\widehat{B}$ açısı

Açının ölçüsü

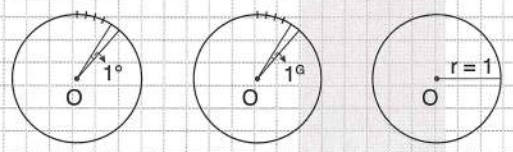
The measurement of the angle

$m(\widehat{ABC})$

$s(\widehat{ABC})$

Açı Ölçü Çeşitleri | Types of Angle Measurement

Derece *Degree*	Grad *Gradient*	Radyan *Radians*



360 parça *360 pieces*	400 parça *400 pieces*	Radyan *Radians*

$$360° = 400^G = 2\pi$$

$$\frac{\text{Derece}}{180} = \frac{\text{Grad}}{200} = \frac{\text{Radyan}}{\pi}$$

- Aşağıda grad olarak verilen açı ölçü birimlerini dereceye çeviriniz.

  Convert the angle measurement units to degrees which are given in gradients below.

  a) 150^G = _____ ?

  b) 320^G = _____ ?

  c) 80^G = _____ ?

  d) 220^G = _____ ?

- Aşağıda derece olarak verilen açı ölçü birimlerini radyana çeviriniz.

  Convert the angle measurement units to radients which are given in degrees below.

  a) 120° = _____ ?

  b) 30° = _____ ?

  c) 210° = _____ ?

  d) 300° = _____ ?

- Aşağıda radyan olarak verilen açı ölçü birimlerini dereceye çeviriniz.

  Convert the angle measurement units to degrees which are given in radients below.

  a) $\frac{2\pi}{3}$ = _____ ?

  b) $\frac{3\pi}{2}$ = _____ ?

  c) $\frac{\pi}{4}$ = _____ ?

  d) $\frac{4\pi}{5}$ = _____ ?

- Aşağıda grad olarak verilen açı ölçü birimlerini radyana çeviriniz.

  Convert the angle measurement units to radients which are given in gradients below.

  a) 100^G = _____ ?

  b) 120^G = _____ ?

  c) 250^G = _____ ?

  d) 300^G = _____ ?

- Aşağıda radyan olarak verilen açı ölçü birimlerini grada çeviriniz.

  Convert the angle measurement units to gradients which are given in radients below.

  a) $\frac{\pi}{4}$ = _____ ?

  b) $\frac{2\pi}{5}$ = _____ ?

  c) $\frac{3\pi}{4}$ = _____ ?

  d) $\frac{3\pi}{2}$ = _____ ?

- Aşağıda derece olarak verilen açı ölçü birimlerini grada çeviriniz.

  Convert the angle measurement units below given in gradients to degrees.

  a) 90° = _____ ?

  b) 150° = _____ ?

  c) 210° = _____ ?

  d) 330° = _____ ?

ÖZELLİK | Property 2

Derecenin Alt Birimleri | Degree Subunits

$1° = 60' \rightarrow$ 60 dakika *(to minute)*

$1' = 60'' \rightarrow$ 60 saniye *(to second)*

$1° = 3600''$

Örnek | Example

$5000'' \rightarrow$

```
5000 | 60
480  | 83 | 60
 200 = 60 | 1°
 180  23'
  20''
```

$1°\ 23'\ 20''$

1. $20°10'14'' = x''$

$\Rightarrow x = ?$

$72614''$

2. $13°12'34'' = x''$

$\Rightarrow x = ?$

$47554''$

3. $4880'' = x°y'z''$

$\Rightarrow x°y'z'' = ?$

$1°21'20''$

4. $3734'' = x°y'z''$

$\Rightarrow x°y'z'' = ?$

$1°2'14''$

5. $8113'' = x°y'z''$

$\Rightarrow x°y'z'' = ?$

$2°15'13''$

6. $K = 32°43'40''$

$L = 40°20'30''$

$\Rightarrow K + L = ?$

$73°4'10''$

7.
$$\begin{array}{r} 10°\ 30'\ 50'' \\ +\ 15°\ 40'\ 40'' \\ \hline ? \end{array}$$

$26°11'30''$

8.
$$\begin{array}{r} 15°\ 30'\ 40'' \\ +\ 20°\ 10'\ 30'' \\ \hline ? \end{array}$$

$35°41'10''$

9.
$$\begin{array}{r} 15°\ 30'\ 40'' \\ -\ 10°\ 40'\ 50'' \\ \hline ? \end{array}$$

$4°49'50''$

10.
$$\begin{array}{r} 20°\ 40'\ 12'' \\ -\ 10°\ 50'\ 20'' \\ \hline ? \end{array}$$

$9°49'52''$

11. $K = 63°15'30''$

$L = 50°20'40''$

$\Rightarrow K - L = ?$

$12°54'50''$

12. ABC üçgen *(triangle)*

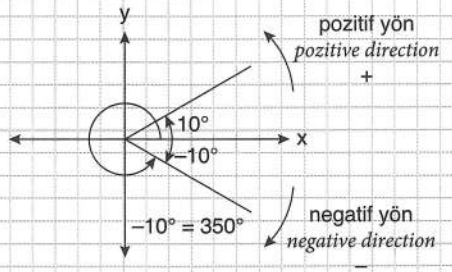
$m(\widehat{A}) = 42°40'40''$

$m(\widehat{B}) = 70°50'30''$

$\Rightarrow m(\widehat{C}) = ?$

$66°28'50''$

ÖZELLİK | Property 3



$k \in Z$

$\alpha = \alpha + 360° \cdot k$

$\alpha = \alpha + 2k\pi$

$0 \leq \alpha < 360°$

$\alpha \rightarrow$ esas ölçü *(principal measurement)*

Aşağıda verilen açı ölçülerinin esas ölçülerini bulunuz.

Find the principle measurements of the angles below.

1. $1000° = ?$ — 280°

2. $2000° = ?$ — 200°

3. $5506° = ?$ — 106°

4. $8740° = ?$ — 100°

5. $-50° = ?$ — 310°

6. $-140° = ?$ — 220°

7. $-1452° = ?$ — 348°

8. $-2400° = ?$ — 120°

9. $7\pi = ?$ — π

10. $18\pi = ?$ — 0

11. $\frac{75\pi}{2} = ?$ — $\frac{3\pi}{2}$

12. $\frac{80\pi}{3} = ?$ — $\frac{2\pi}{3}$

13. $-\frac{\pi}{3} = ?$ — $\frac{5\pi}{3}$

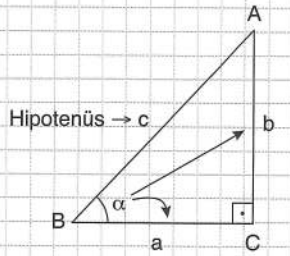
14. $\frac{-62\pi}{5} = ?$ — $\frac{8\pi}{5}$

15. $-\frac{21\pi}{4} = ?$ — $\frac{3\pi}{4}$

ÖZELLİK | Property 4

Trigonometrik Fonksiyonların Tanımları (Dik Üçgende)

Definition of the Trigonometric Functions (Right Triangle)



α açısının karşı dik kenarı b

b opposite of α angle

α açısının komşu dik kenarı a

a adjacent of α angle

$$\cos\alpha = \frac{\text{Komşu dik kenar uzunluğu}}{\text{Hipotenüs uzunluğu}} = \frac{a}{c}$$

$$\sin\alpha = \frac{\text{Karşı dik kenar uzunluğu}}{\text{Hipotenüs uzunluğu}} = \frac{b}{c}$$

$$\tan\alpha = \frac{\text{Karşı dik kenar uzunluğu}}{\text{Komşu dik kenar uzunluğu}} = \frac{b}{a}$$

$$\cot\alpha = \frac{\text{Komşu dik kenar uzunluğu}}{\text{Karşı dik kenar uzunluğu}} = \frac{a}{b}$$

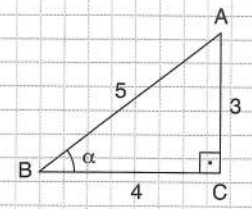
$$\cos\alpha = \frac{\textit{Lenght of adjacent}}{\textit{Lenght of hypotenuse}} = \frac{a}{c}$$

$$\sin\alpha = \frac{\textit{Lenght of opposite}}{\textit{Lenght of hypotenuse}} = \frac{b}{c}$$

$$\tan\alpha = \frac{\textit{Lenght of opposite}}{\textit{Lenght of adjacent}} = \frac{b}{a}$$

$$\cot\alpha = \frac{\textit{Lenght of adjacent}}{\textit{Lenght of opposite}} = \frac{a}{b}$$

Örnek | Example



$\sin\alpha = \frac{3}{5}$

$\cos\alpha = \frac{4}{5}$

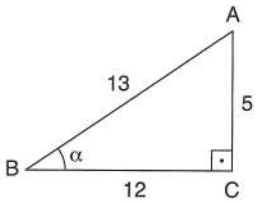
$\tan\alpha = \frac{3}{4}$

$\cot\alpha = \frac{4}{3}$

Aşağıdaki dik üçgenlerde verilen açıların trigonometrik değerlerini bulunuz.

Find the trigonometric values of the angles of the right angle given below.

1.



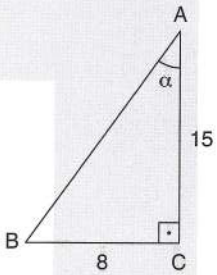
$\sin\alpha =$ _____?

$\cos\alpha =$ _____?

$\tan\alpha =$ _____?

$\cot\alpha =$ _____?

2.



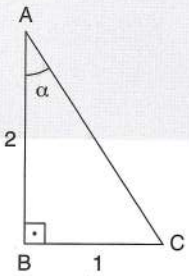
$\sin\alpha =$ _____?

$\cos\alpha =$ _____?

$\tan\alpha =$ _____?

$\cot\alpha =$ _____?

3.



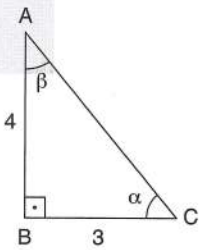
$\sin\alpha =$ _____?

$\cos\alpha =$ _____?

$\tan\alpha =$ _____?

$\cot\alpha =$ _____?

4.



$\sin\alpha =$ _____?

$\cos\alpha =$ _____?

$\tan\alpha =$ _____?

$\cot\alpha =$ _____?

$\sin\beta =$ _____?

$\cos\beta =$ _____?

$\tan\beta =$ _____?

$\cot\beta =$ _____?

ÖZELLİK | Property 5

Dar açılı bir üçgenin bir trigonometrik değeri verildiğinde dik üçgen çizilerek diğer trigonometrik değerler bulunabilir.

If one trigonometric value is given of an acute triangle other trigonometric value can be found by drawing a right angle.

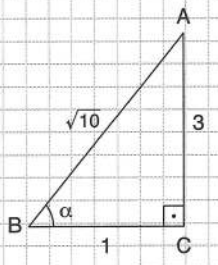
Örnek | Example

$0 < \alpha < 90°$

$\tan\alpha = 3$ ise $\sin\alpha$, $\cos\alpha$ ve $\cot\alpha$ değerleri nedir?.

If $\tan\alpha = 3$ what are the values of $\sin\alpha$, $\cos\alpha$ ve $\cot\alpha$?

Çözüm | Answer



$\sin\alpha = \frac{3}{\sqrt{10}}$

$\cos\alpha = \frac{1}{\sqrt{10}}$

$\cot\alpha = \frac{1}{3}$

1. $0 < x < 90°$

$\tan x = \frac{1}{2}$

$\Rightarrow \sin x = ?$

$\frac{1}{\sqrt{5}}$

2. $0 < x < 90°$

$\sin x = \frac{4}{5}$

$\Rightarrow \tan x = ?$

$\frac{4}{3}$

3. $0 < x < 90°$

$\sin x = \frac{5}{13}$

$\Rightarrow \cot x = ?$

$\frac{12}{5}$

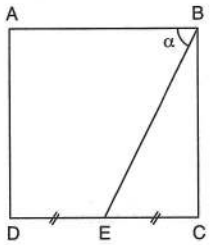
4. $0 < x < 90°$

$\tan x = \frac{1}{3}$

$\Rightarrow \cos x + \sin x = ?$

$\frac{4}{\sqrt{10}}$

5.



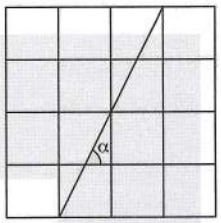
ABCD kare

ABCD square

$\Rightarrow \tan\alpha = ?$

2

6.



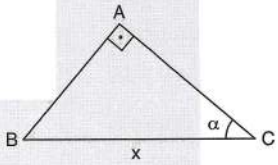
Şekil eş karelerden oluşmuştur.

The figure consists of congruent squares

$\Rightarrow \sin\alpha = ?$

$\frac{2}{\sqrt{5}}$

7.



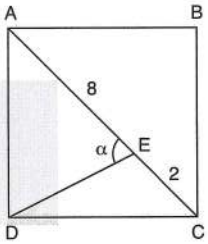
Ç(ABC) = 24 br

$\sin\alpha = \frac{4}{5}$

$\Rightarrow x = ?$

10

8.



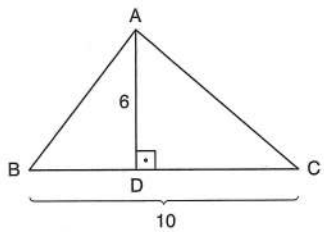
ABCD kare

ABCD square

$\Rightarrow \tan\alpha = ?$

$\frac{5}{3}$

9.



$3 \cdot \tan\widehat{B} = 2 \cdot \tan\widehat{C}$

$\Rightarrow |AB| = ?$

$6\sqrt{2}$

ÖZELLİK | Property 6

- $\dfrac{\sin\alpha}{\cos\alpha} = \tan\alpha$
- $\dfrac{\cos\alpha}{\sin\alpha} = \cot\alpha$
- $\tan\alpha \cdot \cot\alpha = 1$

  $\tan\alpha = \dfrac{1}{\cot\alpha}$ $\qquad$ $\cot\alpha = \dfrac{1}{\tan\alpha}$
- $\sin^2\alpha + \cos^2\alpha = 1$

  $\sin^2\alpha = 1 - \cos^2\alpha = (1-\cos\alpha)\cdot(1+\cos\alpha)$

  $\cos^2\alpha = 1 - \sin^2\alpha = (1-\sin\alpha)\cdot(1+\sin\alpha)$
- $\sec\alpha = \dfrac{1}{\cos\alpha}$
- $\operatorname{cosec}\alpha = \dfrac{1}{\sin\alpha}$

1. $0 < x < 90°$

$4 \cdot \cos x = 3 \cdot \sin x$

$\Rightarrow \tan x = ?$

$\boxed{\dfrac{4}{3}}$

2. $0 < x < 90°$

$\dfrac{\cos x + \sin x}{\sin x} = \dfrac{3}{2}$

$\Rightarrow \tan x = ?$

$\boxed{2}$

3. $0 < x < 90°$

$\dfrac{\cos x + \sin x}{\sin x - \cos x} = 2$

$\Rightarrow \cos x = ?$

$\boxed{\dfrac{1}{\sqrt{10}}}$

4. $\tan x < 1$

$\tan x + \cot x = \dfrac{5}{2}$

$\Rightarrow \sin x = ?$

$\boxed{\dfrac{1}{\sqrt{5}}}$

5. $\dfrac{\sin^2 x}{1 - \cos x} = ?$

$\boxed{1 + \cos x}$

6. $\dfrac{1 - \tan x}{1 - \cot x} = ?$

$\boxed{-\tan x}$

7. $\dfrac{1 + \sin x - \cos^2 x}{\sin x} = ?$

$\boxed{1 + \sin x}$

8. $\dfrac{(\sec x + \tan x)(1 - \sin x)}{\cos x} = ?$

$\boxed{1}$

9. $(\sec x + \operatorname{cosec} x) \cdot \sin x \cdot \cos x = ?$

$\boxed{\cos x + \sin x}$

10. $\dfrac{1}{\sec^2 x} + \sin^2 x = ?$

$\boxed{1}$

11. $\left(\dfrac{\sin x - \tan x}{\sin^3 x}\right) \cdot (1 + \cos x) = ?$

$\boxed{-\sec x}$

12. $\dfrac{\cos x + 1}{\sec x} - \cos^2 x = ?$

$\boxed{\cos x}$

13. $\dfrac{\cos^2 x - \sin^2 x}{2\cos^2 x - 1} = ?$

$\boxed{1}$

14. $\dfrac{2\cos^2 x - 1}{2\sin^2 x - 1} = ?$

$\boxed{-1}$

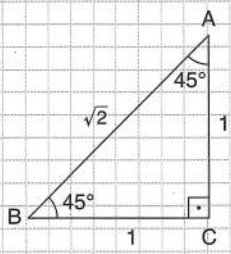
15. $\dfrac{4 - 4\sin^2 x + \cos^2 x}{\cos^2 x} = ?$

$\boxed{5}$

ÖZELLİK | Property 7

30°, 45°, 60°'nin Trigonometrik Değerleri

Trigonometric Values of 30°, 40°, 60°

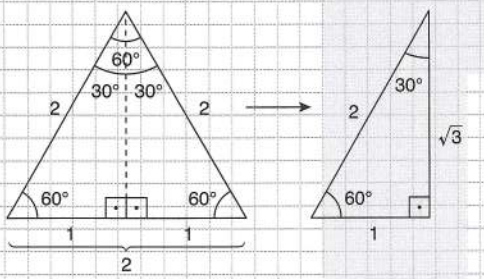


$\tan 45° = 1$

$\cot 45° = 1$

$\sin 45° = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

$\cos 45° = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$



$\sin 30° = \frac{1}{2}$

$\cos 30° = \frac{\sqrt{3}}{2}$

$\tan 30° = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

$\cot 30° = \sqrt{3}$

$\sin 60° = \frac{\sqrt{3}}{2}$

$\cos 60° = \frac{1}{2}$

$\tan 60° = \sqrt{3}$

$\cot 60° = \frac{\sqrt{3}}{3}$

1. $\sin 30° + \tan 60° = ?$ $\boxed{\frac{1+2\sqrt{3}}{2}}$

2. $\cos 45° - \cot 45° = ?$ $\boxed{\frac{\sqrt{2}-2}{2}}$

3. $\frac{\sin 30° - \cos 30°}{\cot 30°} = ?$ $\boxed{\frac{1-\sqrt{3}}{2\sqrt{3}}}$

4. $\frac{\cos 45° - \sin 45°}{\cot 60°} = ?$ $\boxed{0}$

5. $\frac{\sin 60° + \cos 30°}{\tan 60°} = ?$ $\boxed{1}$

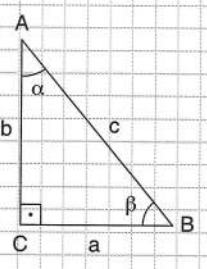
6. $\frac{\tan 30° \cdot \cos 30°}{\sin 60°} = ?$ $\boxed{\frac{1}{\sqrt{3}}}$

7. $\frac{\tan\left(\frac{\pi}{4}\right) + \cot\left(\frac{\pi}{4}\right)}{\sin\left(\frac{\pi}{6}\right)} = ?$ $\boxed{4}$

8. $\frac{\sin\left(\frac{\pi}{3}\right)}{\tan\left(\frac{\pi}{6}\right)} = ?$ $\boxed{\frac{3}{2}}$

9. $\frac{\cot\left(\frac{\pi}{3}\right) \cdot \cos\left(\frac{\pi}{6}\right)}{\tan\left(\frac{\pi}{4}\right)} = ?$ $\boxed{\frac{1}{2}}$

ÖZELLİK | Property 8



$$\alpha + \beta = 90°$$
$$\sin\alpha = \cos\beta$$
$$\tan\alpha = \cot\beta$$

1. $\dfrac{\sin 20°}{\cos 70°} = ?$ — 1

2. $\dfrac{\tan 15° + \cot 50°}{\cot 75° + \tan 40°} = ?$ — 1

3. $\dfrac{3\sin 40° + \cos 50°}{\cos 50°} = ?$ — 4

4. $\sin^2 20° + \sin^2 70° + 2\tan 10° \cdot \tan 80° = ?$ — 3

5. $\dfrac{\sin 22°}{\cos 68°} - 2 + 3 \cdot \tan 5° \cdot \tan 85° = ?$ — 2

6. $\cos^2 10° + \cos^2 80° - \dfrac{2\sin 10°}{\cos 80°} = ?$ — -1

7. $\dfrac{\cos 24° + \sin 34°}{\sin 66° + \cos 56°} = ?$ — 1

8. $2\sin^2\dfrac{5\pi}{16} + 2\sin^2\dfrac{3\pi}{16} = ?$ — 2

9. $\cos 20° \cdot \operatorname{cosec} 20° \cdot \cot 70° = ?$ — 1

10. $\dfrac{\tan\left(\dfrac{\pi}{7}\right) \cdot \tan\left(\dfrac{5\pi}{14}\right)}{\sin^2\left(\dfrac{\pi}{10}\right) + \sin^2\left(\dfrac{2\pi}{5}\right)} = ?$ — 1

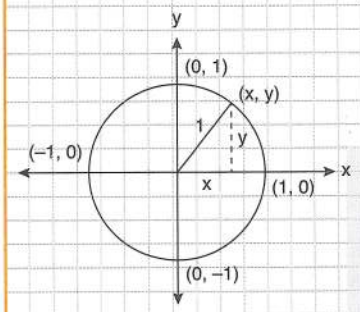
11. $\dfrac{\sin 18° - \sin 45° + \sin 72°}{\cos 18° - \cos 45° + \cos 72°} = ?$ — 1

12. $\dfrac{\cot 25°}{\tan 65°} + 1 + \sin^2 40° + \dfrac{1}{\sec^2 40°} = ?$ — 3

ÖZELLİK | Property 9

Trigonometrik Fonksiyonların Tanımları (Birim Çemberde)

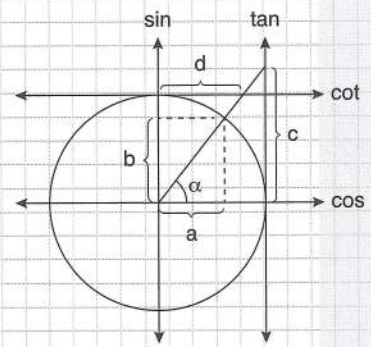
Definition of Trigonometric Functions (Unit Circle)



Birim çember denklemi

Equation of a Unit Circle

$x^2 + y^2 = 1$



$\cos\alpha = a$

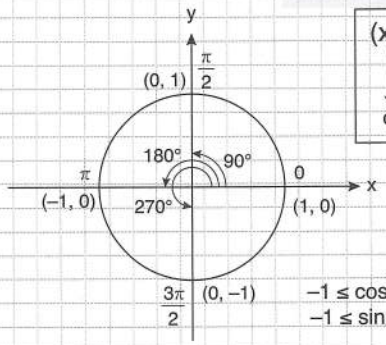
$\sin\alpha = b$

$\tan\alpha = c$

$\cot\alpha = d$

0°, 90°, 180° ve 270°'nin Trigonometrik Değerleri

Trigonometric Values of 0°, 90°, 180° and 270°

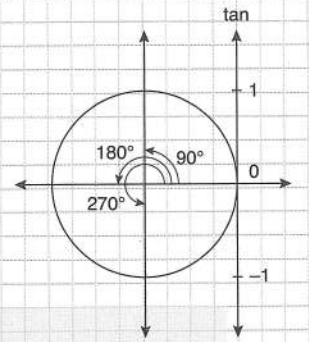


(x, y)
↓ sinα
↓ cosα

$-1 \le \cos\alpha \le 1$

$-1 \le \sin\alpha \le 1$

cos 0° = 1	sin 0° = 0
cos 90° = 0	sin 90° = 1
cos 180° = –1	sin 180° = 0
cos 270° = 0	sin 270° = –1

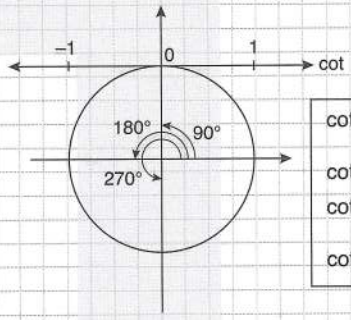


tan0° = 0

tan90° tanımsız *undefinded*

tan180° = 0

tan270° tanımsız *undefinded*



cot 0° tanımsız *undefinded*

cot 90° = 0

cot 180° tanımsız *undefinded*

cot 270° = 0

1. $\dfrac{\sin 45° + \tan 45°}{\cos 180°} = ?$ $\quad \dfrac{-2-\sqrt{2}}{2}$

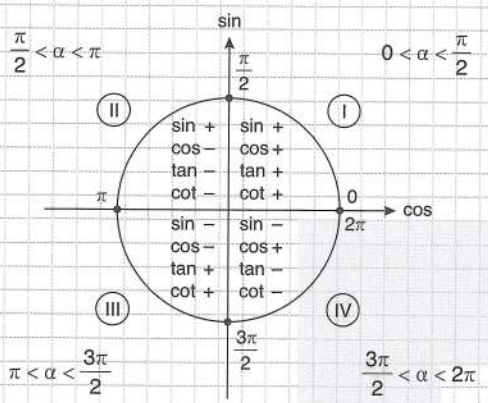
2. $\dfrac{\sin 90° - \cos 90°}{\cos 0°} = ?$ $\quad 1$

3. $\dfrac{\tan 45° - \sin 180°}{\cos 60°} = ?$ $\quad 2$

4. $\dfrac{\sin 270° + \sin 60°}{\cos 45°} = ?$ $\quad \dfrac{-2+\sqrt{3}}{\sqrt{2}}$

ÖZELLİK | Property 10

Trigonometrik Bölgeler
Trigonometric Sections



Geniş bir açının trigonometrik değeri verildiğinde, diğer trigonometrik değerlerinin sayısal değerleri dar açılı dik üçgende bulunur. Açının bölgesine göre trigonometrik fonksiyonunun işareti verilir.

When a trigonometric value of an angle is given the numerical value of the other trigonometric values can be found in the right angle. The sign of the trigonometric function is given according to the section of an angle.

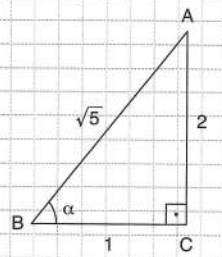
Örnek | Example

$\pi < \alpha < \frac{3\pi}{2}$

$\tan\alpha = 2$ ise $\cos\alpha$, $\sin\alpha$ ve $\cot\alpha$ değerleri nedir?

If $\tan\alpha = 2$ what are the values of $\cos\alpha$, $\sin\alpha$ and $\cot\alpha$?

Çözüm | Answer



$\cot\alpha = \frac{1}{2}$

$\cos\alpha = -\frac{1}{\sqrt{5}}$

$\sin\alpha = -\frac{2}{\sqrt{5}}$

1. $90° < x < 180°$

$\cos x = \frac{-3}{5}$

$\Rightarrow \tan x = ?$

$-\frac{4}{3}$

2. $180° < x < 270°$

$\tan x = \frac{15}{8}$

$\Rightarrow \cos x = ?$

$-\frac{8}{17}$

3. $270° < x < 360°$

$\cos x = \frac{12}{13}$

$\Rightarrow \tan x - \cot x = ?$

$\frac{119}{60}$

4. $\frac{\pi}{2} < x < \pi$

$\sin x = \frac{1}{3}$

$\Rightarrow \tan x - \cot x = ?$

$\frac{7}{2\sqrt{2}}$

5. $\frac{\pi}{2} < x < \pi$

$\cos x = \frac{-4}{5}$

$\Rightarrow \tan x + \cot x = ?$

$-\frac{25}{12}$

6. $\frac{3\pi}{2} < x < 2\pi$

$\tan x = \frac{-2}{3}$

$\Rightarrow \cos x - \sin x = ?$

$\frac{5}{\sqrt{13}}$

7. $\pi < x < \frac{3\pi}{2}$

$\frac{\sin x - \cos x}{\sin x + \cos x} = \frac{1}{3}$

$\Rightarrow \cos x = ?$

$-\frac{1}{\sqrt{5}}$

8. $\pi < x < \frac{3\pi}{2}$

$2\sin x = 5\cos x$

$\Rightarrow \cot x = ?$

$\frac{2}{5}$

ÖZELLİK | Property 11

Geniş açıların trigonometrik değeri bulunurken aşağıdaki 3 madde dikkate alınır.

While finding the trigonometric values of an obtuse angles 3 points below should be taken into consideration.

- Geniş açılar 90°, 180°, 270° veya 360° yardımıyla yazılır.

  Obtuse angles are written by the help of 90°, 180°, 270° and 360°.

- Bölgeye göre işaret bulunur.

  The sign is found according to the section.

- 90° veya 270°'nin yardımıyla yazılırsa trigonometrik fonksiyon değişir.

  If it is written by the help of 90 and 270 the trigonometric function changes.

  $\sin\alpha \leftrightarrow \cos\alpha$

  $\tan\alpha \leftrightarrow \cot\alpha$

  180° veya 360° nin yardımıyla yazılırsa trigonometrik fonksiyon değişmez.

  If it is written by the help of 180° and 360° the trigonometric function does not change.

Örnek | Example

$\sin(210°) = \sin(180° + 30°) = -\sin 30°$

$= \sin(270° - 60°) = -\cos 60°$

$\tan(120°) = \tan(180° - 60°) = -\tan 60°$

$= \tan(90° + 30°) = -\cot 30°$

Not | Note

- $\alpha + \beta = 90°$

  $\sin\alpha = \cos\beta$

  $\tan\alpha = \cot\beta$

- $\alpha + \beta = 180°$

  $\cos\alpha = -\cos\beta$

  $\sin\alpha = \sin\beta$

  $\tan\alpha = -\tan\beta$

  $\cot\alpha = -\cot\beta$

- $\cos(-\alpha) = \cos\alpha$

  $\sin(-\alpha) = -\sin\alpha$

  $\tan(-\alpha) = -\tan\alpha$

  $\cot(-\alpha) = -\cot\alpha$

1. $2 \cdot \sin 150° + \cos 120° = ?$ $\boxed{\frac{1}{2}}$

2. $\tan 225° - \tan 45° = ?$ $\boxed{0}$

3. $\cos 210° + \tan 300° = ?$ $\boxed{-\frac{3\sqrt{3}}{2}}$

4. $\dfrac{\tan 225° - \cot 315°}{\sin 150°} = ?$ $\boxed{4}$

5. $x = \sin 25°$

$\Rightarrow \dfrac{\sin 205° + \cos 115°}{\tan(-25°)} = ?$ $\boxed{2\sqrt{1-x^2}}$

6. $\dfrac{\cos 170° - \sin 100°}{\cos 350°} = ?$ $\boxed{-2}$

7. $x = \cos 20°$

$\Rightarrow \dfrac{\cos(-20°)}{\sin(-20°)\cdot\cos 160°} = ?$

$\boxed{\dfrac{1}{\sqrt{1-x^2}}}$

8. $x = \sin 15°$

$\Rightarrow \cos 105° - \sin 165° = ?$

$\boxed{-2x}$

9. $0 < x < 90°$ $\quad \sin x = \dfrac{1}{2}$

$\Rightarrow \sin(90° + x) - \tan(180° - 4x) = ?$

$\boxed{-\dfrac{\sqrt{3}}{2}}$

10. $0 < x < \dfrac{\pi}{2}$ $\quad \sin x = \dfrac{2}{3}$

$\Rightarrow \sin\left(\dfrac{3\pi}{2} - x\right) + \cos\left(\dfrac{\pi}{2} + x\right) = ?$

$\boxed{\dfrac{-\sqrt{5}-2}{3}}$

11. $0 < \alpha < \dfrac{\pi}{2}$

$\Rightarrow \cos(\pi - \alpha) + \sin\left(\dfrac{3\pi}{2} - \alpha\right) = ?$

$\boxed{-2\cos\alpha}$

12. $0 < x < \dfrac{\pi}{2}$

$\Rightarrow \tan\left(\dfrac{\pi}{2} + x\right) - \cot\left(\dfrac{3\pi}{2} + x\right) = ?$

$\boxed{-\cot x + \tan x}$

13. $0 < \alpha < \dfrac{\pi}{2}$

$\Rightarrow \dfrac{\sin(9\pi - \alpha) - \cos\left(\dfrac{11\pi}{2} - \alpha\right)}{\tan(9\pi + \alpha) + \cot\left(\dfrac{3\pi}{2} - \alpha\right)} = ?$

$\boxed{\cos\alpha}$

14. $\pi < \alpha < \dfrac{3\pi}{2}$

$\cos(13\pi - \alpha) - \sin\left(\dfrac{\pi}{2} - \alpha\right) = 1$

$\Rightarrow \tan\alpha = ?$

$\boxed{\sqrt{3}}$

15. $\sin(\alpha - 7\pi) - \cos\left(\alpha - \dfrac{3\pi}{2}\right) = ?$

$\boxed{0}$

16. $\alpha + \beta = \dfrac{3\pi}{2}$ $\quad \tan\alpha = \dfrac{1}{2}$

$\Rightarrow \sin(2\alpha + \beta) = ?$

$\boxed{\dfrac{-2}{\sqrt{5}}}$

17. $\alpha + \beta = 90°$

$\sin\alpha = \dfrac{3}{5}$

$\Rightarrow \tan(3\alpha + 2\beta) - \cos(\beta - \pi) = ?$

$\boxed{\dfrac{27}{20}}$

18. $\alpha + \beta = \dfrac{\pi}{2}$

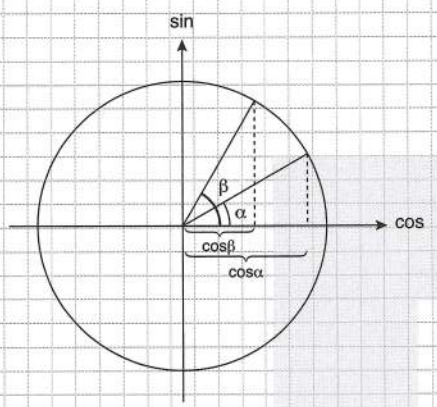
$\Rightarrow \sin^2(2\beta + \alpha) - \cos^2(2\alpha + \beta) = ?$

$\boxed{0}$

ÖZELLİK | Property 12

Trigonometrik Fonksiyonlarda Sıralama
Sequence in Trigonometric Functions

Kosinüs | Cosinus



$\alpha < \beta$

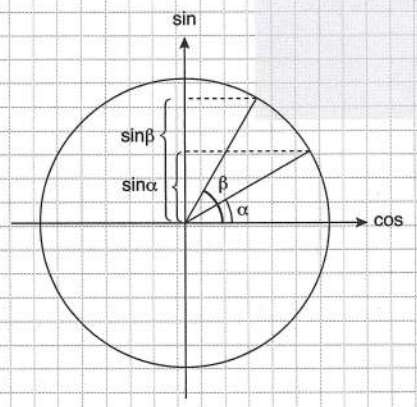
$\cos\beta < \cos\alpha$

I. bölgede kosinüs azalan fonksiyondur.

In the I. section cosinus is the decreasing function

$\cos 50° < \cos 20°$

Sinüs | Sinus



$\alpha < \beta$

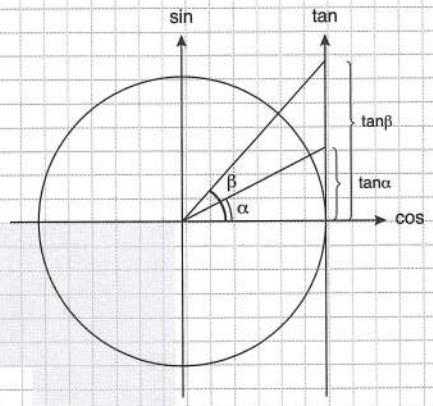
$\sin\alpha < \sin\beta$

I. bölgede sinüs artan fonksiyondur.

In the I. section sinus is the increasing function.

$\sin 40° < \sin 50°$

Tanjant | Tangent



$\alpha < \beta$

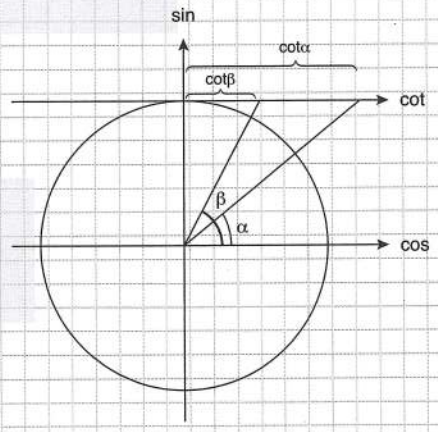
$\tan\alpha < \tan\beta$

I. bölgede tanjant artan fonksiyondur.

In the I. section tangent is the increasing function

$\tan 50° < \tan 60°$

Kotanjant | Cotangent



$\alpha < \beta$

$\cot\beta < \cot\alpha$

I. bölgede kotanjant azalan fonksiyondur.

In the I. section cotangent is the decreasing function

$\cot 30° < \cot 20°$

Açılar I. bölgede değilse Özellik 11'deki kurallar uygulanarak değerler I. bölgeye taşınır. Fonksiyonlar tamamen ya sinüs/kosinüs ya da tanjant/kotanjant'a çevrilir.

If angles are not in the I. section values are moved to I. section by applying the property 11. Functions are converted to either sinus/cosinus or tangent/cotangent.

sin ⟷ cos $\quad \alpha + \beta = 90°$

tan ⟷ cot $\quad \sin\alpha = \cos\beta$

$\tan\alpha = \cot\beta$

Örnek | Example

$a = \sin 20° \longrightarrow \sin 20°$

$b = \cos 50° \longrightarrow \sin 40°$

$c = \sin 170° = \sin(180° - 10°) \longrightarrow \sin 10°$

$d = \cos 320° = \cos(270° + 50°) \longrightarrow \sin 50°$

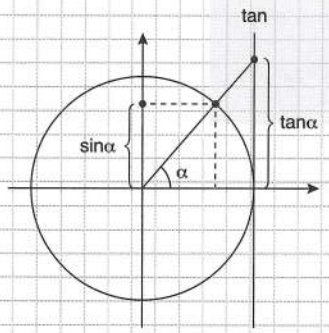
$c < a < b < d$

Sinüs ve Tanjantın Karşılaştırılması

Comparison of Sinus and Tangent

a) Açılar aynı ise *(if the angles are same)*

$\sin\alpha < \tan\alpha \quad \left(0 < \alpha \le \frac{\pi}{2}\right)$



b) Açılar farklı ise *(if the angles are different)*

$-1 \le \sin\alpha \le 1$

$\tan 45° = 1$

$a = \sin 70° \rightarrow a < 1$

$b = \tan 50° \rightarrow b > 1$

$a < b$

1. $a = \sin 20°$

$b = \cos 110°$

$c = \tan 150°$

$d = \cot 210°$

Bu ifadelerin işaretleri sırasıyla nedir?

What are the signs of the expressions respectively?

$\boxed{+, -, -, +}$

2. $a = \cos 60°$

$b = \sin 210°$

$c = \tan 150°$

$d = \cot 100°$

Bu ifadelerin işaretleri sırasıyla nedir?

What are the signs of the expressions respectively?

$\boxed{+, -, -, -}$

3. $a = \cos(-120°)$

$b = \sin(-120°)$

$c = \tan(-120°)$

Bu ifadelerin işaretleri sırasıyla nedir?

What are the signs of the expressions respectively?

$\boxed{-, -, +}$

4. $x = \sin 20°$

$y = \sin 35°$

$z = \cos 40°$

$\Rightarrow ? < ? < ?$

$\boxed{x < y < z}$

5. $a = \cos 30°$

$b = \sin 140°$

$c = \tan 140°$

$\Rightarrow ? < ? < ?$

$\boxed{c < b < a}$

6. $a = \cos 124°$

$b = \cos 724°$

$c = \cos 744°$

$\Rightarrow ? < ? < ?$

$\boxed{a < c < b}$

7. $a = \cos 140°$

$b = \sin 140°$

$c = \tan 130°$

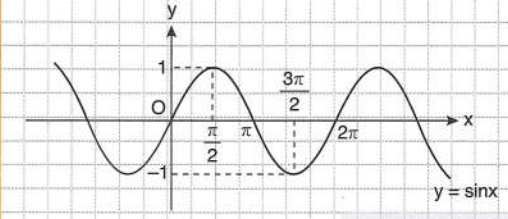
$\Rightarrow ? < ? < ?$

$\boxed{c < a < b}$

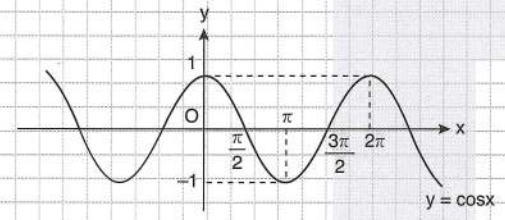
ÖZELLİK | Property 13

Trigonometrik Fonksiyonların Grafikleri
The Graphs of Trigonometric Functions

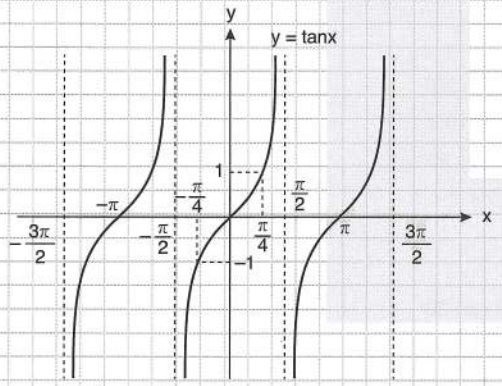
Sinüs | Sinus



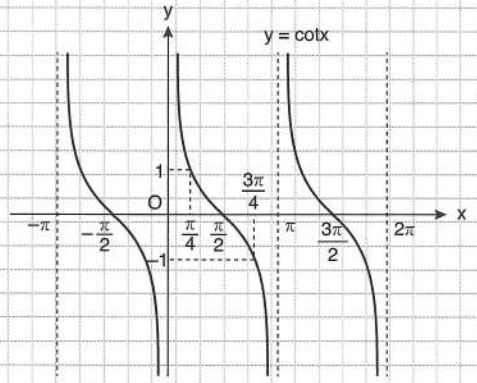
Kosinüs | Cosinus



Tanjant | Tangent



Kotanjant | Cotangent



Trigonometrik Fonksiyonların Periyodu
The Period of Trigonometric Functions

$k, a, b \in R$

$f(x) = k \cdot \sin^n(ax + b)$ → $P = \dfrac{2\pi}{|a|}$, n tek ise *(If n is odd)*

$f(x) = k \cdot \sin^n(ax + b)$ → $P = \dfrac{\pi}{|a|}$, n çift ise *(If n is even)*

$f(x) = k \cdot \cos^n(ax + b)$ → $P = \dfrac{2\pi}{|a|}$, n tek ise *(If n is odd)*

$f(x) = k \cdot \cos^n(ax + b)$ → $P = \dfrac{\pi}{|a|}$, n çift ise *(If n is even)*

$f(x) = k \cdot \tan^n(ax + b) \longrightarrow P = \dfrac{\pi}{|a|}$

$f(x) = k \cdot \cot^n(ax + b) \longrightarrow P = \dfrac{\pi}{|a|}$

$f(x) = h(x) + g(x)$

$h(x) \longrightarrow$ periyodu T_1 *(T_1 period)*

$g(x) \longrightarrow$ periyodu T_2 *(T_2 period)*

f(x)'in periyodu OKEK(T_1, T_2)

OKEK (T_1, T_2) is the period of f(x))

Aşağıda verilen fonksiyonların esas periyotlarını bulunuz.

Find the principle periods of the given functions below.

1. $f(x) = \cos^4(3x - 2)$ — $\dfrac{\pi}{3}$

2. $f(x) = \sin(6x - 2)$ — $\dfrac{\pi}{3}$

3. $f(x) = \sin^6(4x - 2)$ — $\dfrac{\pi}{4}$

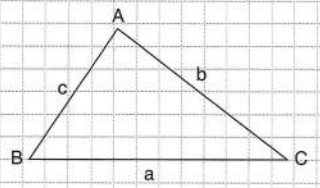
4. $f(x) = \dfrac{2}{3} + 2\tan^3(6x - 1)$ — $\dfrac{\pi}{6}$

5. $f(x) = \cot^4(8x - 1)$ — $\dfrac{\pi}{8}$

6. $f(x) = \sin^4(5x + 1) + \cot(3x + 4)$ — π

ÖZELLİK | Property 14

Kosinüs Teoremi | Cosinus Theorem

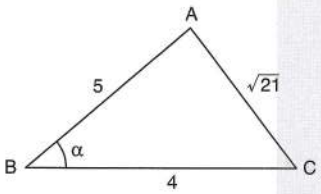


$a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos\widehat{A}$

$b^2 = a^2 + c^2 - 2 \cdot a \cdot c \cdot \cos\widehat{B}$

$c^2 = a^2 + b^2 - 2 \cdot a \cdot b \cdot \cos\widehat{C}$

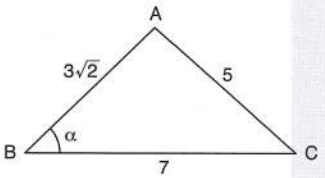
1.



$\Rightarrow \alpha = ?$

$\boxed{60°}$

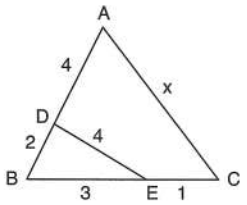
2.



$\Rightarrow \alpha = ?$

$\boxed{45°}$

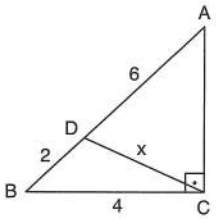
3.



$\Rightarrow x = ?$

$\boxed{8}$

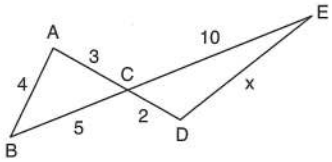
4.



$\Rightarrow x = ?$

$\boxed{2\sqrt{3}}$

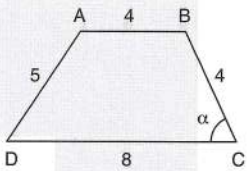
5.



$\Rightarrow x = ?$

$\boxed{4\sqrt{5}}$

6.



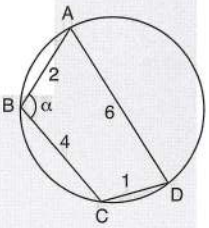
ABCD yamuk

ABCD trapezoid

$\Rightarrow \cos\alpha = ?$

$\boxed{\frac{7}{32}}$

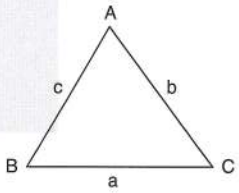
7.



$\Rightarrow \cos\alpha = ?$

$\boxed{-\frac{17}{28}}$

8.

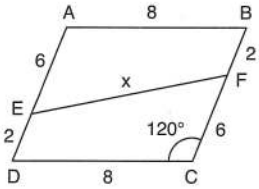


$a^2 = b^2 + c^2 + bc$

$\Rightarrow \cos(\widehat{A}) = ?$

$\boxed{-\frac{1}{2}}$

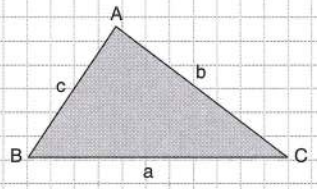
9.



$\Rightarrow x = ?$

$\boxed{4\sqrt{7}}$

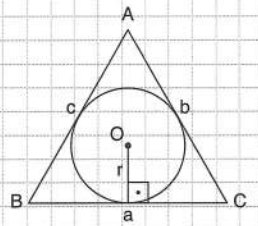
ÖZELLİK | Property 15



$A(ABC) = \frac{1}{2} b \cdot c \cdot \sin\widehat{A}$

$A(ABC) = \frac{1}{2} a \cdot c \cdot \sin\widehat{B}$

$A(ABC) = \frac{1}{2} a \cdot b \cdot \sin\widehat{C}$



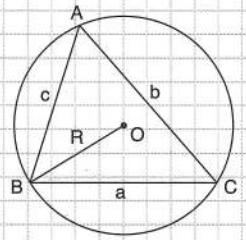
$a + b + c = 2u$

$A(ABC) = u \cdot r$

$a + b + c = 2u$

$A(ABC) = \sqrt{u(u-a)(u-b)(u-c)}$

Sinüs Teoremi | Sinus Theorem



ABC üçgeninin kenar uzunlukları a, b, c

Side lenghts of ABC triangle are a, b, c

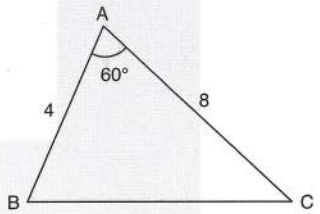
Çevrel çemberin yarıçapı R

Radius of the circumscribed circle is R

$$\frac{a}{\sin\widehat{A}} = \frac{b}{\sin\widehat{B}} = \frac{c}{\sin\widehat{C}} = 2R$$

$A(ABC) = \frac{a \cdot b \cdot c}{4R}$

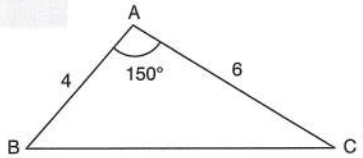
1.



$\Rightarrow A(ABC) = ?$

$8\sqrt{3}$

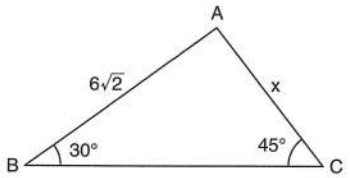
2.



$\Rightarrow A(ABC) = ?$

6

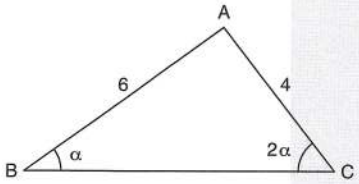
3.



$\Rightarrow x = ?$

$\boxed{6}$

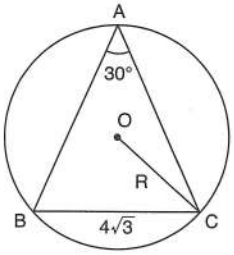
4.



$\Rightarrow \cos\alpha = ?$

$\boxed{\frac{3}{4}}$

5.



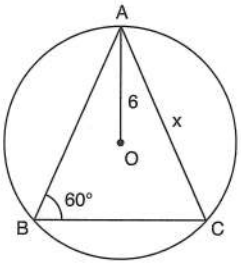
O merkez

O center

$\Rightarrow R = ?$

$\boxed{4\sqrt{3}}$

6.



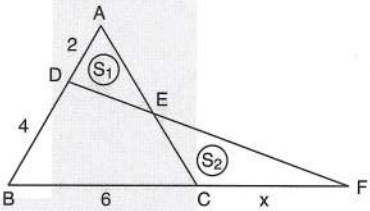
O merkez

O center

$\Rightarrow x = ?$

$\boxed{6\sqrt{3}}$

7.

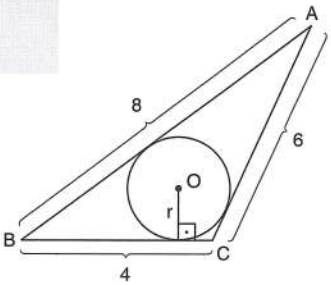


$S_1 = S_2$

$\Rightarrow x = ?$

$\boxed{3}$

8.



$\Rightarrow r = ?$

$\boxed{\frac{\sqrt{15}}{3}}$

ÖZELLİK | Property 16

Ters Trigonometrik Fonksiyonlar
Inverse Trigonometrical Function

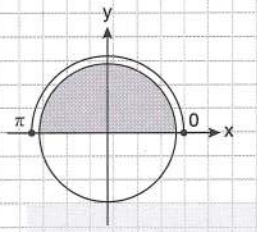
Arkkosinüs | Arccosinus

$f(x): [0, \pi] \to [-1, 1]$

$f(x) = \cos x$

$f^{-1}(x): [-1, 1] \to [0, \pi]$

$f^{-1}(x) = \arccos x$



Örnek | Example

$\arccos\left(\frac{1}{2}\right) = 60° = \frac{\pi}{3}$

$\arccos(1) = 0$

$\arccos\left(-\frac{1}{2}\right) = 120° = \frac{2\pi}{3}$

$\arccos\left(\frac{1}{\sqrt{2}}\right) = \frac{\pi}{4}$

$\arccos\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$

$\arccos\left(-\frac{\sqrt{3}}{2}\right) = \frac{5\pi}{6}$

$\arccos(2) = \emptyset$

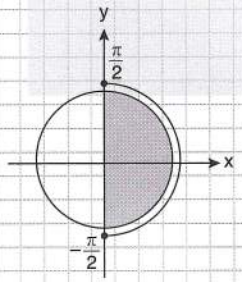
Arksinüs | Arcsinus

$f(x): \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \to [-1, 1]$

$f(x) = \sin x$

$f^{-1}(x): [-1, 1] \to \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

$f^{-1}(x) = \arcsin x$



Örnek | Example

$\arcsin\left(\frac{1}{2}\right) = \frac{\pi}{6}$

$\arcsin\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$

$\arcsin\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{3}$

$\arcsin\left(-\frac{\sqrt{3}}{2}\right) = -\frac{\pi}{3}$

$\arcsin(1) = \frac{\pi}{2}$

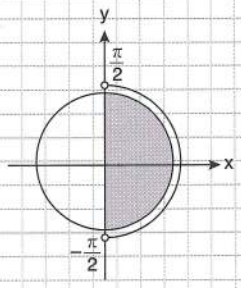
Arktanjant | Arctangent

$f(x): \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \to R$

$f(x): \tan x$

$f^{-1}(x): R \to \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

$f^{-1}(x) = \arctan x$



Örnek | Example

$\arctan(1) = \frac{\pi}{4}$

$\arctan(\sqrt{3}) = \frac{\pi}{3}$

$\arctan(-1) = -\frac{\pi}{4}$

$\arctan\left(-\frac{1}{\sqrt{3}}\right) = -\frac{\pi}{6}$

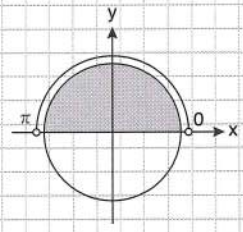
Arkkotanjant | Arccotangent

$f(x): (0, \pi) \to R$

$f(x): \cot x$

$f^{-1}(x): R \to (0, \pi)$

$f^{-1}(x) = \operatorname{arccot} x$



Örnek | Example

$\operatorname{arccot}(1) = \frac{\pi}{4}$

$\operatorname{arccot}(-1) = 135° = \frac{3\pi}{4}$

$\operatorname{arccot}(0) = \frac{\pi}{2}$

Not | Note

$(f \circ f^{-1})(x) = x$

$\sin(\arcsin(x)) = x$

$\arctan(\tan(x)) = x$

1. $\arcsin(1) = x$

$\Rightarrow x = ?$

$\boxed{\frac{\pi}{2}}$

2. $\arccos\left(\frac{-\sqrt{2}}{2}\right) = x$

$\Rightarrow x = ?$

$\boxed{\frac{3\pi}{4}}$

3. $\arctan(-\sqrt{3}) = x$

$\Rightarrow x = ?$

$\boxed{-\frac{\pi}{3}}$

4. $\tan(\arctan(7)) = ?$

$\boxed{7}$

5. $\arcsin\left(\sin\left(\frac{\pi}{5}\right)\right) = ?$

$\boxed{\frac{\pi}{5}}$

6. $\cos\left(\arcsin\left(\frac{3}{5}\right)\right) = x$

$\Rightarrow x = ?$

$\boxed{\frac{4}{5}}$

7. $\tan\left(\operatorname{arccot}\left(\frac{1}{2}\right)\right) = x$

$\Rightarrow x = ?$

$\boxed{2}$

8. $\sin(\arctan(3)) = ?$

$\boxed{\frac{3}{\sqrt{10}}}$

9. $\cos\left(\arcsin\left(\frac{1}{2}\right) + \arctan(\sqrt{3})\right) = ?$

$\boxed{0}$

10. $\sin\left(\frac{\pi}{2} + \arctan\left(\frac{5}{12}\right)\right) = ?$

$\boxed{\frac{12}{13}}$

ÖZELLİK | Property 17

Toplam ve Fark Formülleri
Sum and Difference Formulas

- $\sin(\alpha+\beta) = \sin\alpha \cdot \cos\beta + \cos\alpha \cdot \sin\beta$
- $\sin(\alpha-\beta) = \sin\alpha \cdot \cos\beta - \cos\alpha \cdot \sin\beta$
- $\cos(\alpha+\beta) = \cos\alpha \cdot \cos\beta - \sin\alpha \cdot \sin\beta$
- $\cos(\alpha-\beta) = \cos\alpha \cdot \cos\beta + \sin\alpha \cdot \sin\beta$
- $\tan(\alpha+\beta) = \dfrac{\tan\alpha + \tan\beta}{1 - \tan\alpha \cdot \tan\beta}$
- $\tan(\alpha-\beta) = \dfrac{\tan\alpha - \tan\beta}{1 + \tan\alpha \cdot \tan\beta}$
- $\cot(\alpha+\beta) = \dfrac{\cot\alpha \cdot \cot\beta - 1}{\cot\alpha + \cot\beta}$
- $\cot(\alpha-\beta) = \dfrac{\cot\alpha \cdot \cot\beta + 1}{\cot\beta - \cot\alpha}$

1. $\cos(30° + 45°) = ?$ $\boxed{\dfrac{\sqrt{6}-\sqrt{2}}{4}}$

2. $\sin 75° = ?$ $\boxed{\dfrac{\sqrt{6}+\sqrt{2}}{4}}$

3. $\cos 15° = ?$ $\boxed{\dfrac{\sqrt{6}+\sqrt{2}}{4}}$

4. $\cos 20° \cdot \cos 10° - \sin 20° \cdot \sin 10° = ?$ $\boxed{\dfrac{\sqrt{3}}{2}}$

5. $\sin 45° \cdot \cos 15° + \sin 15° \cdot \cos 45° = ?$ $\boxed{\dfrac{\sqrt{3}}{2}}$

6. $10x = \pi$

$\Rightarrow \cos(3x) \cdot \cos(2x) - \sin(3x) \cdot \sin(2x) = ?$ $\boxed{0}$

7. $\sin(40°+2x) \cdot \cos(20° - 2x) + \sin(20° - 2x) \cdot \cos(40°+2x) = ?$ $\boxed{\dfrac{\sqrt{3}}{2}}$

8. $\tan(75°) = ?$ $\boxed{2+\sqrt{3}}$

9. $\tan(15°) = ?$ $\boxed{2-\sqrt{3}}$

10. $\dfrac{\tan 70° + \tan 65°}{1 - \tan 70° \cdot \tan 65°} = ?$ $\boxed{-1}$

11. $\tan x = \dfrac{1}{2}$

$\cot y = \dfrac{1}{3}$

$\Rightarrow \cot(x+y) = ?$ $\boxed{-\dfrac{1}{7}}$

12. $0 < a + b < \dfrac{\pi}{2}$

$\cot a = 3$

$\cot b = 2$

$\Rightarrow a + b = ?$ $\boxed{45°}$

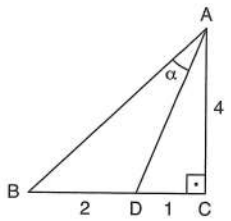
13. $\cot a = \dfrac{1}{2}$

$\cot b = \dfrac{1}{3}$

$\Rightarrow \cot(a-b) = ?$ $\boxed{-7}$

14. $\cot(-75°) = ?$ $\boxed{\sqrt{3}-2}$

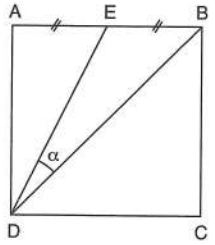
15.



$\Rightarrow \tan\alpha = ?$

$\boxed{\frac{8}{19}}$

16.



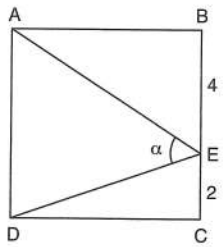
ABCD kare

ABCD square

$\Rightarrow \cot\alpha = ?$

$\boxed{3}$

17.



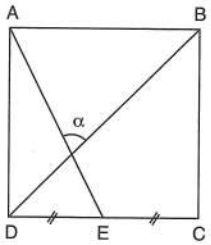
ABCD kare

ABCD square

$\Rightarrow \tan\alpha = ?$

$\boxed{\frac{9}{7}}$

18.



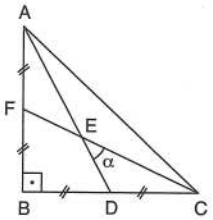
ABCD kare

ABCD square

$\Rightarrow \sin\alpha = ?$

$\boxed{\frac{3\sqrt{10}}{10}}$

19.

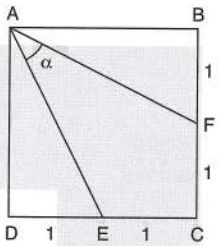


$[AB] \perp [BC]$

$\Rightarrow \tan\alpha = ?$

$\boxed{\frac{3}{4}}$

20.



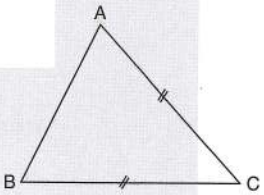
ABCD kare

ABCD square

$\Rightarrow \cot\alpha = ?$

$\boxed{\frac{4}{3}}$

21.



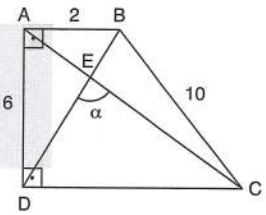
$|AC| = |BC|$

$\tan(\widehat{C}) = \frac{3}{4}$

$\Rightarrow \cot(\widehat{A}) = ?$

$\boxed{\frac{1}{3}}$

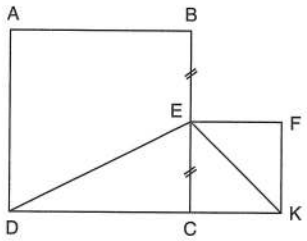
22.



$\Rightarrow \tan\alpha = ?$

$\boxed{\frac{9}{2}}$

23.



ABCD kare *(square)*

EFKC kare *(square)*

$|BE| = |EC|$

$\Rightarrow \tan(\widehat{DEK}) = ?$

$\boxed{-3}$

ÖZELLİK | Property 18

Yarım Açı Formülleri | Half Angle Formulas

- $\sin(2a) = \sin(a + a) = \sin a \cdot \cos a + \cos a \cdot \sin a$

  $\sin(2a) = 2 \cdot \sin a \cdot \cos a$

- $\cos(2a) = \cos(a + a) = \cos a \cdot \cos a - \sin a \cdot \sin a$

  $\cos(2a) = \cos^2 a - \sin^2 a$

  $\cos(2a) = 1 - 2\sin^2 a$

  $\cos(2a) = 2\cos^2 a - 1$

- $\tan(2a) = \tan(a + a) = \dfrac{\tan a + \tan a}{1 - \tan a \cdot \tan a}$

  $\tan(2a) = \dfrac{2\tan a}{1 - \tan^2 a}$

- $\cot(2a) = \dfrac{\cot^2 a - 1}{2\cot a}$

1. $2 \cdot \sin x \cdot \cos x = ?$

$\sin(2x)$

2. $x \in \left(0, \dfrac{\pi}{2}\right)$

$\cos x = \dfrac{3}{5}$

$\Rightarrow \sin(2x) = ?$

$\dfrac{24}{25}$

3. $x \in \left(\pi, \dfrac{3\pi}{2}\right)$

$\tan x = \dfrac{3}{4}$

$\Rightarrow \cos(2x) = ?$

$\dfrac{7}{25}$

4. $2 \cdot \sin 75° \cdot \cos 75° = ?$

$\dfrac{1}{2}$

5. $\cos^2 15° - \sin^2 15° = ?$

$\dfrac{\sqrt{3}}{2}$

6. $\sin 20° = k$

$\Rightarrow \cos 50° = ?$

$2k\sqrt{1 - k^2}$

7. $\cos 25° = t$

$\Rightarrow \cos 50° = ?$

$2t^2 - 1$

8. $\sin x - \cos x = \dfrac{1}{2}$

$\Rightarrow \sin(2x) = ?$

$\dfrac{3}{4}$

9. $\sin x + \cos x = \frac{1}{3}$

$\Rightarrow \sin(2x) = ?$

$-\frac{8}{9}$

10. $\frac{\sin(2x)}{2\cos^2\left(\frac{x}{2}\right) - 1} = ?$

$2\sin x$

11. $\sin 10° \cdot \cos 10° \cdot \cos 20° \cdot \cos 40° = x \cdot \sin 80°$

$\Rightarrow x = ?$

$\frac{1}{8}$

12. $\sin x = \frac{4}{5}$

$\Rightarrow \sin\left(\frac{x}{2}\right) = ?$

$\frac{1}{\sqrt{5}}$

13. $\cos(2x) = \frac{3}{5}$

$\Rightarrow \tan x = ?$

$\frac{1}{2}$

14. $\frac{\sin 60°}{\cos 15°} + \frac{\cos 60°}{\sin 15°} = ?$

$2\sqrt{2}$

15. $0 < x < \frac{\pi}{2}$

$\Rightarrow \sqrt{1 + \sin(2x)} = ?$

$\sin x + \cos x$

16. $\frac{\pi}{2} < x < \pi$

$\cot x = \frac{-4}{3}$

$\Rightarrow \tan(2x) = ?$

$-\frac{24}{7}$

17. $0 < x < \frac{\pi}{4}$

$\tan x = \frac{1}{2}$

$\Rightarrow \tan(2x) = ?$

$\frac{4}{3}$

18. $\tan(22{,}5°) = ?$

$\sqrt{2} - 1$

ÖZELLİK | Property 19

Dönüşüm Formülleri | Conversion Formulas

- $\sin x + \sin y = 2\sin\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)$
- $\sin x - \sin y = 2\sin\left(\frac{x-y}{2}\right)\cos\left(\frac{x+y}{2}\right)$
- $\cos x + \cos y = 2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)$
- $\cos x - \cos y = -2\sin\left(\frac{x+y}{2}\right)\sin\left(\frac{x-y}{2}\right)$
- $\tan x + \tan y = \frac{\sin(x+y)}{\cos x \cdot \cos y}$
- $\tan x - \tan y = \frac{\sin(x-y)}{\cos x \cdot \cos y}$
- $\cot x + \cot y = \frac{\sin(x+y)}{\sin x \cdot \sin y}$
- $\cot x - \cot y = \frac{\sin(y-x)}{\sin x \cdot \sin y}$

1. $\sin 105° + \sin 15° = ?$ $\boxed{\frac{\sqrt{6}}{2}}$

2. $\cos 15° + \cos 75° = ?$ $\boxed{\frac{\sqrt{6}}{2}}$

3. $\frac{\sin 20° + \sin 70°}{\cos 85° + \cos 35°} = ?$ $\boxed{\sqrt{2}}$

4. $\frac{\cos(4x) + \cos(2x)}{\sin(4x) + \sin(2x)} = ?$ $\boxed{\cot(3x)}$

5. $\frac{\sin x - \sin(4x) + \sin(7x)}{\cos x - \cos(4x) + \cos(7x)} = ?$ $\boxed{\tan(4x)}$

ÖZELLİK | Property 20

Ters Dönüşüm Formülleri
Inverse Conversion Formulas

- $\cos a \cdot \cos b = \frac{1}{2}[\cos(a+b) + \cos(a-b)]$
- $\sin a \cdot \sin b = -\frac{1}{2}[\cos(a+b) - \cos(a-b)]$
- $\sin a \cdot \cos b = \frac{1}{2}[\sin(a+b) + \sin(a-b)]$
- $\cos a \cdot \sin b = \frac{1}{2}[\sin(a+b) - \sin(a-b)]$

1. $\cos\left(\frac{3\pi}{8}\right) \cdot \cos\left(\frac{\pi}{8}\right) = ?$ $\boxed{\frac{\sqrt{2}}{4}}$

2. $4\sin 70° \cdot \cos 50° - 2\cos 70° = ?$ $\boxed{\sqrt{3}}$

3. $\cos 10° = a$

$\Rightarrow \cos 35° \cdot \sin 65° - \frac{1}{4} = ?$ $\boxed{\frac{a}{2}}$

4. $\frac{1 + \cos 40°}{\cos 55° \cdot \cos 35°} = ?$ $\boxed{4\cos 20°}$

ÖZELLİK | Property 21

Trigonometrik Denklem | Trigonometric Equation

- $\sin\alpha = \sin\beta \Rightarrow \alpha = \beta + 2k\pi$

  $\alpha = (\pi - \beta) + 2k\pi$

  $\cos\alpha = \cos\beta \Rightarrow \alpha = \beta + 2k\pi$

  $\alpha = -\beta + 2k\pi$

  $\tan\alpha = \tan\beta \Rightarrow \alpha = \beta + k\pi$

  $\cot\alpha = \cot\beta \Rightarrow \alpha = \beta + k\pi$

Homojen Denklem | Homogenous Equation

- $a \neq 0 \quad b \neq 0$

$$a \cdot \sin x + b \cdot \cos x = 0$$

$$a \cdot \sin x = -b \cdot \cos x$$

$$\frac{\sin x}{\cos x} = -\frac{b}{a}$$

$$\tan x = -\frac{b}{a}$$

$$x = \arctan\left(-\frac{b}{a}\right)$$

Lineer Denklem | Linear Equation

- $a\sin x + b\cos x = c \quad a \neq 0 \quad b \neq 0 \quad c \neq 0$

$$\sin x + \frac{b}{a}\cos x = \frac{c}{a} \qquad \boxed{\tan\theta = \frac{b}{a}}$$

$$\sin x + \tan\theta \cdot \cos x = \frac{c}{a}$$

$$\sin x + \frac{\sin\theta}{\cos\theta} \cdot \cos x = \frac{c}{a}$$

$$\frac{\sin(x+\theta)}{\cos\theta} = \frac{c}{a}$$

$$\sin(x+\theta) = \frac{c}{a} \cdot \cos\theta$$

$$(x+\theta) = \arcsin\left(\frac{c}{a} \cdot \cos\theta\right)$$

- $0 \leq x < 2\pi$

  $a\sin x + b\cos x = c$

  $a^2 + b^2 = c^2$ Tek çözüm var *(There is one solution)*

  $a^2 + b^2 > c^2$ İki çözüm var *(There are two solutions)*

  $a^2 + b^2 < c^2$ Çözüm yok *(There is no solution)*

1. $0 \leq x < 360°$

$\sin x = \frac{1}{2}$

$\Rightarrow$ S.S. = ?

$\boxed{\{30°, 150°\}}$

2. $2\cos x = \sqrt{3}$

$\Rightarrow$ S.S. = ?

$\boxed{\left\{\frac{\pi}{6} + 2k\pi\ ,\ \frac{11\pi}{6} + 2k\pi\ ,\ k \in Z\right\}}$

3. $\tan x = -1$

$\Rightarrow$ S.S. = ?

$\boxed{\left\{\frac{3\pi}{4} + k\pi\ ,\ k \in Z\right\}}$

4. $0 \leq x < 360°$

$\tan x = \frac{\sqrt{3}}{3}$

$\Rightarrow$ S.S. = ?

$\boxed{\{30°, 210°\}}$

5. $0 \leq x < 180°$

$\cot(9x + 30°) = \cot(7x + 70°)$

$\Rightarrow$ S.S. = ?

$\boxed{\{20°, 110°\}}$

6. $0 \leq x < 360°$

$2\cos^2 x - 3\cos x + 1 = 0$

$\Rightarrow$ S.S. = ?

$\boxed{\left\{0\ ,\ \frac{\pi}{3}\ ,\ \frac{5\pi}{3}\right\}}$

7. $0 \leq x < 180°$

$\sin x = \sqrt{3}\cos x$

$\Rightarrow$ S.S. = ?

$\boxed{\frac{\pi}{3}}$

1. $270° = x \cdot \pi$
$\Rightarrow x = ?$

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) 1 D) $\frac{2}{3}$ E) $\frac{3}{2}$

2. $150° = x \cdot \pi$
$\Rightarrow x = ?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{3}{4}$ D) $\frac{5}{6}$ E) $\frac{4}{3}$

3. $\frac{4\pi}{3} = x°$
$\Rightarrow x = ?$

A) 90 B) 150 C) 180 D) 240 E) 270

4. $-240° = x \cdot \pi$
$\Rightarrow x = ?$

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) $\frac{2}{3}$ E) $\frac{3}{2}$

5. $30°\ 10'\ 28'' = x''$
$\Rightarrow x = ?$

A) $145218''$ B) $145228''$ C) $108600''$ D) $108628''$ E) $118628''$

6. $16°\ 24'\ 40'' = x''$
$\Rightarrow x = ?$

A) $57600''$ B) $58040''$ C) $58080''$ D) $59040''$ E) $59080''$

7. $K = 44°\ 51'\ 28''$
$L = 40°\ 30'\ 54''$
$\Rightarrow K + L = ?$

A) $88°\ 22'\ 21''$ B) $85°\ 22'\ 22''$ C) $24°\ 21'\ 22''$ D) $84°\ 22'\ 22''$ E) $84°\ 21'\ 22''$

8. $A = 261°\ 12'\ 58''$
$B = 84°\ 40'\ 30''$
$\Rightarrow A - B = ?$

A) $176°\ 32'\ 28''$ B) $184°\ 20'\ 30''$ C) $220°\ 28'\ 28''$ D) $196°\ 32'\ 28''$ E) $187°\ 28'\ 28''$

9. $m(\widehat{A}) + m(\widehat{B}) + m(\widehat{C}) = 180°$
$m(\widehat{A}) = 34°28'22''$
$m(\widehat{B}) = 40°40'40''$
$\Rightarrow m(\widehat{C}) = ?$

A) $100°\,52'\,58''$ B) $102°\,50'\,58''$ C) $103°\,52'\,58''$ D) $104°\,50'\,58''$ E) $105°\,52'\,58''$

10. $m(\widehat{A}) + m(\widehat{B}) + m(\widehat{C}) = 180°$
$m(\widehat{A}) = 2 \cdot m(\widehat{B})$
$m(\widehat{B}) = 36°18'27''$
$\Rightarrow m(\widehat{C}) = ?$

A) $36°\,18'\,37''$ B) $36°\,18'\,36''$ C) $72°\,35'\,54''$ D) $71°\,04'\,39''$ E) $72°\,37'\,54''$

11. $7960'' = x°\,y'\,z''$
$\Rightarrow x°\,y'\,z'' = ?$

A) $18°\,14'\,10''$ B) $16°\,14'\,18''$ C) $10°\,14'\,18''$ D) $2°\,12'\,40''$ E) $20°\,10'\,20''$

12. $157515'' = x°\,y'\,z''$
$\Rightarrow x°\,y'\,z'' = ?$

A) $40°\,50'\,15''$ B) $43°\,45'\,15''$ C) $42°\,50'\,15''$ D) $60°\,44'\,18''$ E) $60°\,44'\,16''$

13. $k \in Z$
$0 \le x < 2\pi$
$-\frac{31\pi}{4} = x + 2k\pi$
$\Rightarrow x = ?$

A) $\frac{\pi}{4}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{2}$ D) $\frac{3\pi}{4}$ E) $\frac{2\pi}{3}$

14. $k \in Z$
$0 \le x < 2\pi$
$\frac{58\pi}{5} = x + 2k\pi$
$\Rightarrow x = ?$

A) $\frac{9\pi}{5}$ B) $\frac{8\pi}{5}$ C) $\frac{7\pi}{5}$ D) $\frac{4\pi}{5}$ E) $\frac{3\pi}{5}$

15. $k \in Z$
$0 \le x < 2\pi$
$-\frac{58\pi}{9} = x + 2k\pi$
$\Rightarrow x = ?$

A) $\frac{2\pi}{3}$ B) $\frac{11\pi}{3}$ C) $\frac{4\pi}{3}$ D) $\frac{13\pi}{9}$ E) $\frac{14\pi}{9}$

16. $k \in Z$
$0 \le x < 2\pi$
$-3720° = x + 2k\pi$
$\Rightarrow x = ?$

A) $\frac{2\pi}{3}$ B) $\frac{2\pi}{5}$ C) $\frac{\pi}{2}$ D) $\frac{2\pi}{7}$ E) $\frac{4\pi}{3}$

1. $\dfrac{(1-\sin x)\cdot(1+\sin x)}{\cos^2 x} = ?$

A) tanx B) cosx C) cotx D) –1 E) 1

2. $\sin^3 x + \sin x \cdot \cos^2 x = ?$

A) sinx B) cosx C) 1 D) tanx E) cotx

3. $\sqrt{1+\tan^2 x} = ?$

A) 1 B) secx C) cosecx D) 2 E) cosx

4. $\cos x \cdot \operatorname{cosec} x + \dfrac{\sin x - \cos x}{\sin x} = ?$

A) 1 B) cosx C) sinx D) cosecx E) secx

5. $0 < x < \dfrac{\pi}{2}$

$\dfrac{1-\tan^2 x}{1+\tan^2 x} = \dfrac{1}{2} \Rightarrow \tan x = ?$

A) 0 B) 1 C) $\dfrac{1}{\sqrt{3}}$ D) $\dfrac{2}{\sqrt{3}}$ E) $\sqrt{3}$

6. $(1 - \sin x)\cdot(\tan x + \sec x) = ?$

A) –cosx B) cosx C) sinx D) 1 E) –1

7. $\sin^2 x \cdot (\operatorname{cosec}^2 x + \sec^2 x) = ?$

A) 1 B) secx C) cosecx D) $\sec^2 x$ E) $\operatorname{cosec}^2 x$

8. $\cos x - \cos x \cdot \sin^2 x = ?$

A) 1 B) 3 C) cosx D) cos(3x) E) $\cos^3 x$

9. $\dfrac{1+\cot x}{1+\tan x} = ?$

A) 1 B) sinx C) cosx D) cotx E) tanx

10. $(\sin x - \cos x)^2 + (\sin x + \cos x)^2 = ?$

A) 1 B) 2 C) sinx D) cosx E) tanx

11. $\dfrac{\cos^2 x}{1+\sin x} + \dfrac{\cos^2 x}{1-\sin x} = ?$

A) 2cosx B) cosx C) –2sinx D) 2sinx E) 2

12. $\dfrac{\cos x - \sec x}{\sin x - \operatorname{cosec} x} = ?$

A) $\cot^3 x$ B) cotx C) $\tan^3 x$ D) tanx E) sinx

13. $\dfrac{1+\sin x}{\operatorname{cosec} x} - \sin^2 x = ?$

A) sinx B) –1 C) 0 D) 1 E) cosx

14. $\dfrac{\cos x}{\sec x + \tan x} - \dfrac{\cos x}{\tan x - \sec x} = ?$

A) 2 B) 1 C) –cosx D) –1 E) cosx

15. $\dfrac{\sin^6 x + \cos^6 x}{1 - 3\sin^2 x \cdot \cos^2 x} = ?$

A) sinx B) cosx C) tanx D) 1 E) 0

16. $\sin^2 x \cdot \cos x - \sin^2 x + \cos^3 x - \cos x = ?$

A) $\sin^2 x$ B) $-\sin^2 x$ C) $\cos^2 x$ D) $-\cos^2 x$ E) 1

1. $\dfrac{\sec x - \cos x}{\sin x} + \dfrac{\cos x}{\operatorname{cosec} x - \sin x} = ?$

A) $\tan^2 x$ B) $2\tan x$ C) $\cot x$ D) $\cot^2 x$ E) 1

2. $\left(\dfrac{1}{\cos^2 x} + \dfrac{1}{\sin^2 x}\right) \cdot \tan^2 x = ?$

A) 1 B) $\sec^2 x$ C) $\operatorname{cosec}^2 x$ D) $\sec^4 x$ E) $\operatorname{cosec}^4 x$

3. $\dfrac{\sin^4 x + \cos^2 x - 1}{\sin^2 x - 1} = ?$

A) $\cos^2 x$ B) $\sin^2 x$ C) $-\sin^2 x$ D) 0 E) 1

4. $\left(\dfrac{\cot x}{\sec x} + \dfrac{1}{\tan x}\right) \cdot \dfrac{\tan x}{1 + \sec x} = ?$

A) $\sin x$ B) $\cos x$ C) $\tan x$ D) $\cot x$ E) 1

5. $f(x, y) = x^4 + y^4 + 2x^2y^2$
$\Rightarrow f(\sin x, \cos x) = ?$

A) 1 B) 2 C) 3 D) 4 E) $\sin^2 x$

6. $\dfrac{9 - 9\sin^2 x - 8\cos^2 x}{\cos x} = ?$

A) $-8\cos x$ B) $\sin x$ C) $\cos x$ D) $8\cos x$ E) 9

7. $\dfrac{8 - 8\sin^2 x + \cos^2 x}{\cos^2 x} = ?$

A) 4 B) 8 C) 9 D) $\sin x$ E) $\cos x$

8. $\dfrac{1 - 2\cos^2 x}{2\sin^2 x - 1} = ?$

A) 0 B) 1 C) $\sin^2 x$ D) $\tan x$ E) $\cos^2 x$

9. $\dfrac{3\sin x - 4\cos x}{\cos x + 2\sin x} = \dfrac{1}{2}$

$\Rightarrow \tan x = ?$

A) 1 B) $\dfrac{3}{2}$ C) $\dfrac{7}{4}$ D) 2 E) $\dfrac{9}{4}$

10. $\dfrac{\sin x \cdot \cos x - \sin^2 x}{\sin^2 x - \cos^2 x} : \dfrac{-\sin x}{1 + 2\sin x \cdot \cos x} = ?$

A) sinx – cosx B) –sinx C) 1 D) sinx + cosx E) tanx

11. $0 < x < \dfrac{\pi}{2}$

$\Rightarrow \sqrt{1 + 2\sin x \cdot \cos x} = ?$

A) – sinx – cosx B) 2sinx C) 1 – sinx D) 1 – cosx E) sinx + cosx

12. $\dfrac{1}{\text{cosec}^2 x} + \cos^2 x + 1 = ?$

A) $\cos^2 x$ B) 0 C) 2 D) 2cosx E) sinx

13. $\tan x + \cot x = 2$

$\Rightarrow \tan^2 x + \cot^2 x = ?$

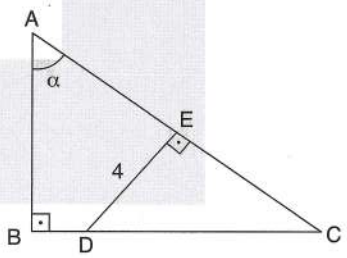
A) –2 B) 0 C) 2 D) 4 E) 6

14. $\sin x + \cos x = \dfrac{1}{2}$

$\Rightarrow \sin x \cdot \cos x = ?$

A) $-\dfrac{3}{8}$ B) $-\dfrac{3}{4}$ C) 1 D) $\dfrac{1}{2}$ E) $\dfrac{3}{4}$

15.



$m(\widehat{BAC}) = \alpha$

$[AB] \perp [BC]$

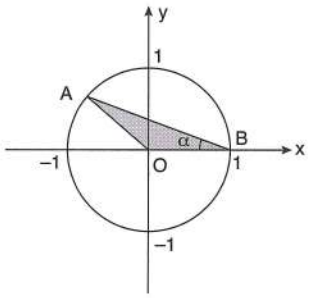
$[DE] \perp [EC]$

$|DE| = 4$ br

$\Rightarrow |DC| = ?$

A) 4tanα B) 4cosα C) 4sinα D) 4secα E) 4cosecα

16.



$m(\widehat{OBA}) = \alpha$

$\Rightarrow A(AOB) = ?$

A) sin(2α) B) sinα C) $\dfrac{\sin\alpha}{2}$ D) $\dfrac{\sin(2\alpha)}{2}$ E) $\dfrac{\cos\alpha}{2}$

1. $0 < x < 90°$

$\tan x = \frac{4}{3}$

$\Rightarrow \sin x - \cos x = ?$

A) $-\frac{1}{5}$ B) $\frac{1}{5}$ C) $\frac{2}{5}$ D) 1 E) $\frac{7}{5}$

2. $x \in \left(0, \frac{\pi}{2}\right)$

$\sin x = \frac{12}{13}$

$\Rightarrow \tan x + \cot x = ?$

A) $\frac{5}{12}$ B) $\frac{12}{13}$ C) $\frac{60}{13}$ D) $\frac{12}{5}$ E) $\frac{169}{60}$

3. $0 < x < 90°$

$\sin x = \frac{1}{2}$

$\Rightarrow \frac{\tan x}{\cot x} = ?$

A) $\frac{\sqrt{3}}{2}$ B) $\frac{1}{3}$ C) 3 D) $\frac{10}{3}$ E) $2\sqrt{5}$

4. $0 < x < 90°$

$\tan x = \frac{1}{2}$

$\Rightarrow \cos x = ?$

A) $\frac{1}{10}$ B) $-\frac{1}{5}$ C) $\frac{1}{\sqrt{5}}$ D) $\frac{2}{\sqrt{5}}$ E) $\frac{3}{\sqrt{5}}$

5. $0 < x < \frac{\pi}{2}$

$\cos x = a$

$\Rightarrow \tan x + \cot x = ?$

A) $\frac{1}{a\sqrt{1-a}}$ B) $\frac{1}{\sqrt{1-a^2}}$ C) $\frac{1}{a\sqrt{1-a^2}}$ D) $\frac{a}{\sqrt{1-a^2}}$ E) $\frac{1}{\sqrt{a-a^2}}$

6. $x \in \left(0, \frac{\pi}{2}\right)$

$4 \cdot \sin x = 3 \cdot \cos x$

$\Rightarrow 2 \cdot \sin x \cdot \cos x = ?$

A) $\frac{3}{5}$ B) $\frac{3}{4}$ C) $\frac{12}{25}$ D) $\frac{24}{25}$ E) $\frac{12}{5}$

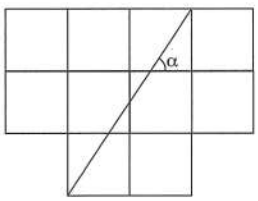
7. $0 < x < \frac{\pi}{2}$

$\frac{\cos x + \sin x}{\cos x - \sin x} = 2$

$\Rightarrow \sec x = ?$

A) $\sqrt{10}$ B) $\frac{\sqrt{10}}{3}$ C) $\frac{1}{3}$ D) $\frac{3}{\sqrt{10}}$ E) 3

8.



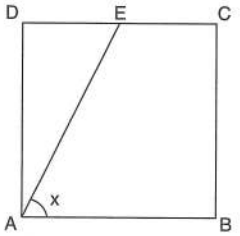
Şekil eş karelerden oluşmuştur.

The figure consists of congruent squares.

$\Rightarrow \cot\alpha = ?$

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) 2 D) $\frac{5}{2}$ E) 3

9.



ABCD kare

ABCD square

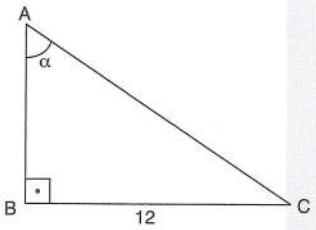
$m(\widehat{EAB}) = x$

$|DE| = 3 \cdot |EC|$

$\Rightarrow \cot x = ?$

A) $\frac{4}{3}$ B) $\frac{4}{5}$ C) $\frac{3}{5}$ D) $\frac{3}{4}$ E) $\frac{1}{4}$

10.



$[AB] \perp [BC]$

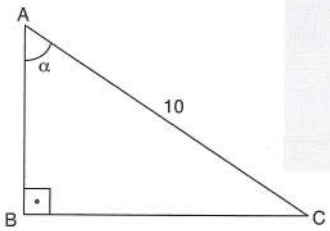
$|BC| = 12$ br

$\cos\alpha = \frac{3}{5}$

$\Rightarrow$ Ç(ABC) = ?

A) 12 B) 24 C) 36 D) 40 E) 48

11.



$[AB] \perp [BC]$

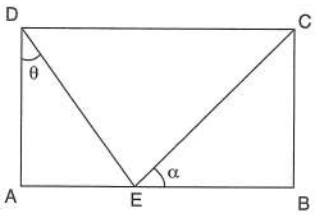
$|AC| = 10$ br

$\tan\alpha = \frac{1}{2}$

$\Rightarrow |AB| + |BC| = ?$

A) $2\sqrt{5}$ B) $4\sqrt{5}$ C) $6\sqrt{5}$ D) 10 E) 20

12.



ABCD dikdörtgen

ABCD rectangle

$\cot\theta = 4$

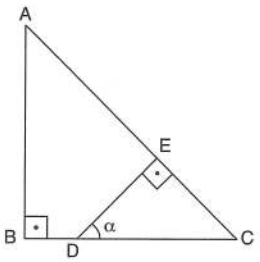
$\tan\alpha = 2$

$|AB| = 9$ br

$\Rightarrow |CE| = ?$

A) $\sqrt{5}$ B) $2\sqrt{5}$ C) $3\sqrt{5}$ D) $4\sqrt{5}$ E) $6\sqrt{5}$

13.



$[AB] \perp [BC]$

$[DE] \perp [EC]$

$|AB| = 36$ br

$|BD| = 22$ br

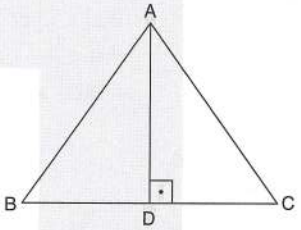
$m(\widehat{EDC}) = \alpha$

$\tan\alpha = \frac{3}{4}$

$\Rightarrow |EC| = ?$

A) 3 B) 4 C) 6 D) 9 E) 12

14.



$[AD] \perp [BC]$

$|AD| = 12$ br

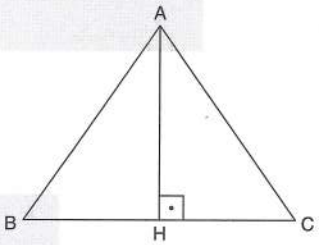
$|BC| = 25$ br

$16 \cdot \tan\widehat{B} = 9 \cdot \tan\widehat{C}$

$\Rightarrow |AB| = ?$

A) 20 B) 15 C) 14 D) 12 E) 10

15.



$[AH] \perp [BC]$

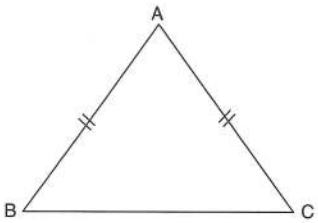
$|AH| = 12$ br

$|BC| = 16$ br

$\Rightarrow \cot\widehat{B} + \cot\widehat{C} = ?$

A) $\frac{4}{3}$ B) $\frac{8}{3}$ C) 3 D) 4 E) 6

16.



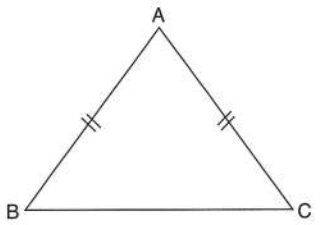
$|AB| = |AC|$

$\sin\widehat{A} = \frac{4}{5}$

$\Rightarrow \cot\widehat{C} = ?$

A) $\frac{1}{2}$ B) $\frac{4}{5}$ C) $\frac{4}{3}$ D) 1 E) 2

1.



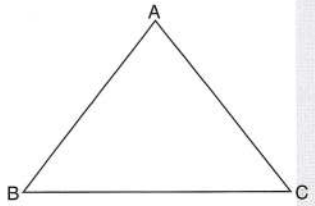
$|AB| = |AC| = 15$ br

$|BC| = 18$ br

$\Rightarrow \tan\widehat{B} = ?$

A) $\frac{4}{3}$ B) $\frac{3}{4}$ C) $\frac{5}{8}$ D) $\frac{8}{5}$ E) $\frac{3}{2}$

2.



$|AB| = 10$ br

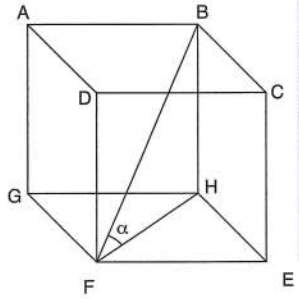
$|BC| = 11$ br

$\sin\widehat{B} = \frac{3}{5}$

$\Rightarrow |AC| = ?$

A) $\sqrt{5}$ B) $3\sqrt{5}$ C) $4\sqrt{5}$ D) 100 E) $6\sqrt{5}$

3.



ABCDEFGH küp

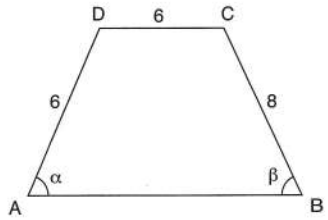
ABCDEFGH cube

$m(\widehat{BFH}) = \alpha$

$\Rightarrow \tan\alpha = ?$

A) $\sqrt{\frac{2}{3}}$ B) $\sqrt{\frac{3}{2}}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{3}}{3}$ E) $\sqrt{\frac{2}{5}}$

4.



ABCD yamuk

ABCD trapozoid

$\alpha + \beta = 90°$

$|DC| = 6$ br

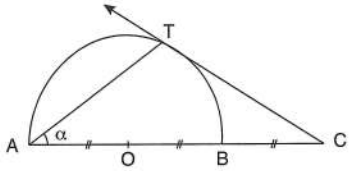
$|CB| = 8$ br

$|AD| = 6$ br

$\Rightarrow \tan\beta = ?$

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{3}{4}$ E) $\frac{4}{3}$

5.



O merkez

O center

$|AO| = 5$ br

$|OB| = 5$ br

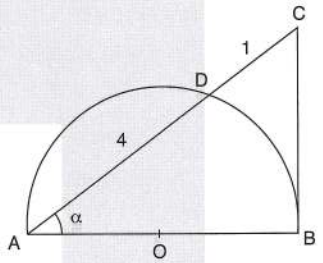
$|BC| = 5$ br

$m(\widehat{TAC}) = \alpha$

$\Rightarrow \cos(2\alpha) = ?$

A) $\frac{1}{5}$ B) $\frac{2}{5}$ C) $\frac{1}{2}$ D) $\frac{3}{4}$ E) $\frac{4}{3}$

6.



O merkez

O center

$|AD| = 4$ br

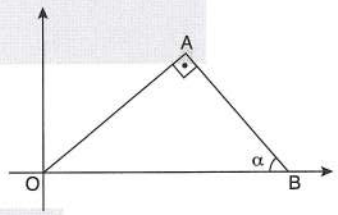
$|DC| = 1$ br

$m(\widehat{CAB}) = \alpha$

$\Rightarrow \cos\alpha = ?$

A) $\frac{1}{\sqrt{5}}$ B) $\frac{2}{\sqrt{5}}$ C) 1 D) $-\frac{1}{\sqrt{5}}$ E) $-\frac{2}{\sqrt{5}}$

7.



$[OA] \perp [AB]$

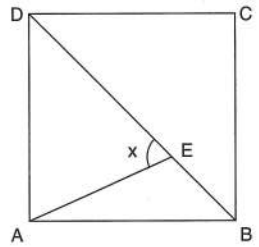
$A = (3, 6)$

$m(\widehat{ABO}) = \alpha$

$\Rightarrow \cot\alpha = ?$

A) $\frac{1}{4}$ B) $\frac{1}{3}$ C) $\frac{1}{2}$ D) $\frac{2}{3}$ E) 2

8.



ABCD kare

ABCD square

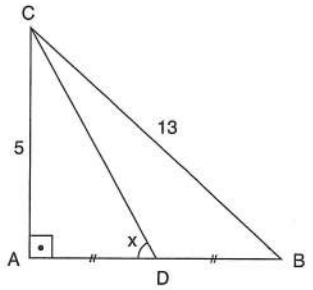
$|DE| = 7 \cdot |EB|$

$m(\widehat{DEA}) = x$

$\Rightarrow \tan x = ?$

A) $\frac{3}{4}$ B) $\frac{4}{5}$ C) $\frac{4}{3}$ D) $\frac{5}{4}$ E) $\frac{5}{3}$

9.



$[CA] \perp [AB]$

$|AD| = |DB|$

$|AC| = 5$ br

$|CB| = 13$ br

$m(\widehat{CDA}) = x$

$\Rightarrow \sin x = ?$

A) $\frac{5}{6}$ B) $\frac{5}{\sqrt{61}}$ C) $\frac{6}{\sqrt{61}}$ D) $\frac{6}{5}$ E) $\frac{7}{5}$

10. $a = 1 + \tan 40° \cdot \tan 50°$

$b = \frac{\cos 24°}{\sin 66°} + 1$

$\Rightarrow a + b = ?$

A) -2 B) -1 C) 1 D) 2 E) 4

11. $\frac{2\sin 70° + \cos 20°}{\sin 70°} - \frac{\tan 15°}{\cot 75°} = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

12. $\frac{\tan 1° \cdot \tan 89° + \tan 2° \cdot \tan 88° + \ldots\ldots\ldots + \tan 44° \cdot \tan 46°}{\sin^2 10° + \sin^2 20° + \sin^2 70° + \sin^2 80°} = ?$

A) 90 B) 89 C) 44 D) 22 E) 11

13. $\sin^2 \frac{3\pi}{10} + \sin^2 \frac{2\pi}{10} + \tan \frac{3\pi}{20} \cdot \tan \frac{7\pi}{20} = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

14. $3\sin^2 \frac{3\pi}{8} + 3\sin^2 \frac{\pi}{8} = ?$

A) -1 B) 0 C) 1 D) 2 E) 3

15. $a = \sin 90° + \cos 180°$

$b = \sin 30° + \cos 60°$

$\Rightarrow a - b = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

16. $\frac{\sin 45° \cdot \tan 30°}{\cot 60° \cdot \cos 60°} = ?$

A) 1 B) $\sqrt{2}$ C) 2 D) $\frac{4\sqrt{2}}{9}$ E) $\frac{5}{2}$

1. $90° < x < 180°$

$\cos x = -\frac{4}{5}$

$\Rightarrow \sin x + \tan x = ?$

A) $\frac{3}{20}$ B) $\frac{1}{5}$ C) $\frac{4}{5}$ D) $-\frac{3}{20}$ E) $-\frac{4}{5}$

2. $\pi < \alpha < \frac{3\pi}{2}$

$\cos\alpha = -\frac{3}{5}$

$\Rightarrow \cot\alpha - \sin\alpha = ?$

A) $\frac{31}{20}$ B) $\frac{23}{20}$ C) $\frac{1}{15}$ D) $-\frac{23}{15}$ E) $-\frac{29}{15}$

3. $\frac{3\pi}{2} < \theta < 2\pi$

$\sin\theta = -\frac{2}{3}$

$\Rightarrow \frac{\tan\theta + \cot\theta}{\tan\theta} = ?$

A) $-\frac{9}{4}$ B) $-\frac{5}{4}$ C) 1 D) $\frac{5}{4}$ E) $\frac{9}{4}$

4. $0 < \alpha < \frac{\pi}{2}$

$\tan\alpha = \frac{5}{12}$

$\Rightarrow \frac{\sin\alpha - \cos\alpha}{\tan\alpha} = ?$

A) $-\frac{84}{65}$ B) $-\frac{79}{65}$ C) $-\frac{72}{65}$ D) $-\frac{64}{65}$ E) $-\frac{44}{65}$

5. $\frac{3\pi}{2} < \alpha < 2\pi$

$\sin\alpha = -\frac{5}{13}$

$\Rightarrow \sec\alpha + \tan\alpha = ?$

A) $-\frac{7}{5}$ B) $-\frac{5}{12}$ C) -1 D) $\frac{2}{3}$ E) $\frac{7}{5}$

6. $\frac{\pi}{2} < \alpha < \pi$

$\sin\alpha = \frac{3}{5}$

$\Rightarrow \tan\alpha - \cos\alpha = ?$

A) $-\frac{1}{20}$ B) $-\frac{31}{25}$ C) 1 D) $\frac{31}{25}$ E) $\frac{1}{20}$

7. $\frac{\cos 210° + \tan 330°}{\sin 300° + \tan 120°} = ?$

A) $\frac{5}{8}$ B) $\frac{5}{9}$ C) $\frac{2}{3}$ D) $\frac{3}{4}$ E) $\frac{5}{4}$

8. $x = \sin 35°$

$\Rightarrow \frac{\sin 215° + \cos 125°}{\tan 325° - \cot 235°} = ?$

A) $x\sqrt{1-x^2}$ B) x C) $\sqrt{1-x^2}$ D) $1-x$ E) $1-x^2$

9. $\sin(-130°) + \cos 40° + \cot(-135°) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

10. $\dfrac{3 \cdot \cos 120° + (-\cos 60°)}{\tan 225° - \cot(-45)} = ?$

A) $2\sqrt{3}$ B) $\sqrt{3}$ C) 1 D) $\dfrac{\sqrt{3}}{4}$ E) -1

11. $\sin x = \dfrac{2}{3}$

$\cos y = \dfrac{1}{3}$

$\Rightarrow \cos\left(\dfrac{\pi}{2} - x\right) - \sin\left(\dfrac{3\pi}{2} + y\right) = ?$

A) $\dfrac{1}{9}$ B) $\dfrac{2}{9}$ C) $\dfrac{1}{3}$ D) $\dfrac{2}{3}$ E) 1

12. $\sin 20° = k$

$\Rightarrow \dfrac{\cos(-20°)}{\tan(-20°) + \cot(-20°)} = ?$

A) k^3 B) $-k^3$ C) k D) $k^3 - k$ E) $k^3 + k$

13. $\dfrac{\sin(3\pi - x) - \sin(8\pi - x)}{\cos(3\pi + x) - \cos(-x)} = ?$

A) $-\tan x$ B) $\tan x$ C) -1 D) 0 E) 1

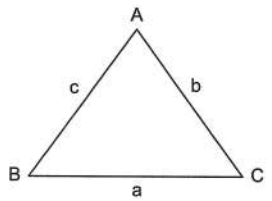
14. $\dfrac{\tan(\pi - x) - \tan(2\pi + x)}{\sin(\pi - x) + \sin(2\pi + x)} = ?$

A) 1 B) $\operatorname{cosec} x$ C) $\cos x$ D) $-\sec x$ E) -1

15. $\dfrac{\cos\left(\dfrac{3\pi}{2} - x\right) + \cos\left(\dfrac{\pi}{2} + x\right)}{\sin\left(\dfrac{\pi}{2} - x\right) + \sin\left(\dfrac{\pi}{2} + x\right)} = ?$

A) 1 B) $\cot x$ C) $\tan x$ D) $-\cot x$ E) $-\tan x$

16.



$\Rightarrow \tan(\widehat{A}) + \tan(\widehat{B} + \widehat{C}) = ?$

A) $-2 \cdot \tan B$ B) $2 \cdot \tan B$ C) $\tan A$ D) 1 E) 0

1. $\tan\left(\frac{13\pi}{3}\right)+\sin\left(\frac{17\pi}{2}\right)-\cos\left(\frac{9\pi}{2}\right)=?$

A) $\sqrt{3}-1$ B) $\sqrt{3}+1$ C) 1 D) -1 E) $\sqrt{3}$

2. $20\alpha=\pi$

$\Rightarrow \frac{\cos(8\alpha)}{\sin(2\alpha)}-\frac{\cot(6\alpha)}{\cot(14\alpha)}=?$

A) -2 B) -1 C) 0 D) 1 E) 2

3. $8x=\pi$

$\Rightarrow \frac{\tan(3x)}{\cot x}-\frac{\cos(5x)}{\cos(3x)}=?$

A) 2 B) 1 C) 0 D) -1 E) -2

4. $0<\alpha<\frac{\pi}{2}$

$\tan\alpha=\frac{1}{2}$

$\Rightarrow \frac{\sin\left(\frac{\pi}{2}+\alpha\right)-\cos\left(\frac{3\pi}{2}-\alpha\right)}{\tan(\pi-\alpha)+\tan(2\pi-\alpha)}=?$

A) $-\frac{3}{\sqrt{5}}$ B) $-\frac{1}{\sqrt{5}}$ C) 0 D) $\frac{1}{\sqrt{5}}$ E) $\frac{2}{\sqrt{5}}$

5. $0<x<\frac{\pi}{2}$

$\cos x=\frac{5}{13}$

$\Rightarrow \frac{\cos(2\pi-x)-\cot(\pi-x)}{\sin\left(\frac{\pi}{2}+x\right)-\tan\left(\frac{3\pi}{2}+x\right)}=?$

A) -1 B) $-\frac{25}{26}$ C) $-\frac{12}{13}$ D) $\frac{12}{13}$ E) 1

6. $\frac{\pi}{2}<x<\pi$

$\sin x=\frac{2}{3}$

$\Rightarrow \frac{2\sin\left(\frac{3\pi}{2}+x\right)-\sin\left(\frac{\pi}{2}+x\right)}{\tan\left(\frac{3\pi}{2}-x\right)}=?$

A) -2 B) -1 C) $\frac{2}{3}$ D) 1 E) $\frac{3}{2}$

7. $\cos(\alpha-17\pi)+\sin\left(\alpha-\frac{11\pi}{2}\right)=?$

A) $2\cos\alpha$ B) $2\sin\alpha$ C) 0 D) $-2\cos\alpha$ E) $-2\sin\alpha$

8. $\frac{\sin(\alpha-11\pi)+\cos\left(\frac{15\pi}{2}-\alpha\right)}{\tan(11\pi+\alpha)-\cot\left(\alpha-\frac{5\pi}{2}\right)}=?$

A) $-\cos\alpha$ B) 0 C) $\cos\alpha$ D) $\sin\alpha$ E) 1

9. $\alpha + \beta = \frac{3\pi}{2}$

$\sin\alpha = \frac{1}{4}$

$\Rightarrow \cos(2\alpha + \beta) = ?$

A) $\frac{1}{4}$ B) $\frac{\sqrt{15}}{4}$ C) $-\frac{1}{4}$ D) $-\frac{1}{2}$ E) $-\frac{1}{\sqrt{15}}$

10. $x + y = \frac{\pi}{4}$

$\cot x = \frac{4}{3}$

$\Rightarrow \sin(3x + 2y) = ?$

A) $-\frac{4}{5}$ B) $-\frac{3}{5}$ C) $\frac{1}{2}$ D) $\frac{3}{5}$ E) $\frac{4}{5}$

11. $A + B = 50°$

$\sin(2A - 10°) = \frac{3}{5}$

$\Rightarrow \cos(2B) = ?$

A) 1 B) $\frac{3}{4}$ C) $\frac{2}{3}$ D) $\frac{3}{5}$ E) $\frac{1}{5}$

12. $A + B = 30°$

$\sin(3A + 2B) = \frac{4}{5}$

$\Rightarrow \tan B = ?$

A) $\frac{4}{5}$ B) $\frac{3}{5}$ C) $\frac{4}{3}$ D) $\frac{2}{5}$ E) $\frac{3}{4}$

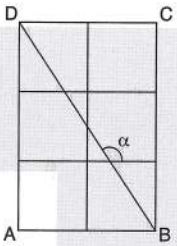
13. $\left.\begin{array}{l} 3x = \sin(\pi + \theta) \\ 4y = \cos(\pi - \theta) \end{array}\right\}$ $\Rightarrow$ x ile y arasındaki bağıntı aşağıdakilerden hangisidir?

What is the correlation between x and y?

A) $3x - 4y = 0$ B) $3x - 4y - 1 = 0$

C) $3x + 4y = 0$ D) $9x^2 + 16y^2 = 0$

E) $9x^2 + 16y^2 = 1$

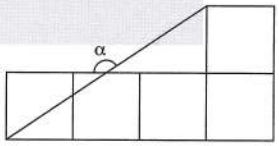
14. 

Şekil eş karelerden oluşmuştur.

The figure consists of congurent squares.

$\Rightarrow \tan\alpha + \cot\alpha = ?$

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $\frac{4}{9}$ D) $-\frac{13}{6}$ E) $-\frac{6}{13}$

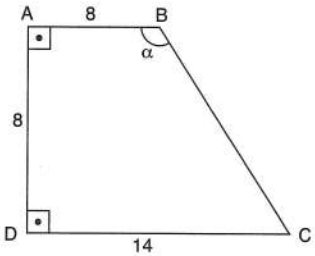
15. 

Şekil eş karelerden oluşmuştur.

The figure consists of congurent squares.

$\Rightarrow \tan\alpha = ?$

A) $-\frac{1}{3}$ B) $-\frac{1}{2}$ C) $-\frac{2}{3}$ D) -2 E) -4

16. 

ABCD dik yamuk

ABCD right trapozoid

$|AB| = 8$ br

$|AD| = 8$ br

$|DC| = 14$ br

$m(\widehat{ABC}) = \alpha$

$\Rightarrow \cos\alpha = ?$

A) $\frac{3}{5}$ B) $-\frac{4}{5}$ C) $-\frac{2}{3}$ D) $-\frac{3}{5}$ E) $-\frac{1}{8}$

1. $0 \le x < 2\pi$
$y = \sin(3x) - 2$
$y \in Z$
$\Rightarrow \sum y = ?$

A) –6 B) –4 C) –2 D) 1 E) 2

2. $0 \le x < 2\pi$
$y = \dfrac{4\cos(2x) - 2}{3}$
$\Rightarrow ? \le y \le ?$

A) $-2 \le y \le 2$ B) $-1 \le y \le 1$
C) $-3 \le y \le 6$ D) $-\frac{2}{3} \le y \le \frac{2}{3}$
E) $-2 \le y \le \frac{2}{3}$

3. $0 \le x < 2\pi$
$A \in Z$
$A = 2 \cdot \sin\left(\dfrac{3x}{4}\right) - 3$
$\Rightarrow \sum A = ?$

A) –15 B) –10 C) –9 D) –7 E) –5

4. $0 \le y < 2\pi$
$0 \le x < 2\pi$
$\max(4 \cdot \cos x - 2 \cdot \sin y) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

5. $\left.\begin{array}{l} a = \sin 15° \\ b = \cos 91° \\ c = \tan 184° \\ d = \cot 271° \end{array}\right\}$ ⇒ Bu ifadelerin işaretleri sırasıyla nedir?
What are the signs of these expressions respectively?

A) –, –, –, – B) +, –, –, +
C) –, +, –, + D) +, –, +, –
E) +, +, –, +

6. $\left.\begin{array}{l} x = \tan\dfrac{4\pi}{3} \\ y = \cos 17\pi \\ z = \sin\dfrac{73\pi}{3} \end{array}\right\}$ ⇒ Bu ifadelerin işaretleri sırasıyla nedir?
What are the signs of these expressions respectively?

A) +, +, – B) +, –, – C) +, +, +
D) –, +, + E) +, –, +

7. $\left.\begin{array}{l} m = \cos(-1420°) \\ n = \sin(-1420°) \\ k = \cot(-1420°) \end{array}\right\}$ ⇒ Bu ifadelerin işaretleri sırasıyla nedir?
What are the signs of these expressions respectively?

A) +, –, – B) +, –, + C) +, +, +
D) –, –, – E) –, +, –

8. $\left.\begin{array}{l} a = \sec(-1002°) \\ b = \operatorname{cosec}(-1002°) \\ c = \tan\left(-\dfrac{66\pi}{7}\right) \end{array}\right\}$ ⇒ Bu ifadelerin işaretleri sırasıyla nedir?
What are the signs of these expressions respectively?

A) +, +, + B) +, –, + C) +, +, –
D) –, +, + E) –, +, –

9. $\left.\begin{array}{l} a=\cos\left(-\frac{63\pi}{5}\right) \\ b=\cot\left(-\frac{71\pi}{5}\right) \\ c=\sec\left(-\frac{32\pi}{5}\right) \end{array}\right\}$ ⇒ Bu ifadelerin işaretleri sırasıyla nedir?

What are the signs of these expressions respectively?

A) +, –, – B) –, –, + C) –, –, –
D) +, –, + E) +, +, +

10. $\left.\begin{array}{l} x=\sin 14° \\ y=\sin 28° \\ z=\cos 35° \end{array}\right\}$ ⇒ Aşağıdaki sıralamalardan hangisi doğrudur?

Which of the following sequencing is correct?

A) $z < y < x$ B) $z < x < y$ C) $y < x < z$
D) $x < y < z$ E) $x < z < y$

11. $\left.\begin{array}{l} a=\cos 20° \\ b=\sin 20° \\ c=\tan 20° \end{array}\right\}$ ⇒ Aşağıdaki sıralamalardan hangisi doğrudur?

Which of the following sequencing is correct?

A) $c < b < a$ B) $a < c < b$ C) $a < b < c$
D) $b < c < a$ E) $b < a < c$

12. $\left.\begin{array}{l} a=\cos 20° \\ b=\cos 550° \\ c=\sin 560° \end{array}\right\}$ ⇒ Aşağıdaki sıralamalardan hangisi doğrudur?

Which of the following sequencing is correct?

A) $b < c < a$ B) $b < a < c$ C) $c < b < a$
D) $c < a < b$ E) $a < b < c$

13. $\left.\begin{array}{l} k=\cos 160° \\ m=\sin 610° \\ n=\tan 610° \end{array}\right\}$ ⇒ Aşağıdaki sıralamalardan hangisi doğrudur?

Which of the following sequencing is correct?

A) $k < m = n$ B) $k < n < m$ C) $k < m < n$
D) $m = k < n$ E) $m < k < n$

14. $\left.\begin{array}{l} a=\sin 30° \\ b=\sin 150° \\ c=\cos 150° \end{array}\right\}$ ⇒ Aşağıdaki sıralamalardan hangisi doğrudur?

Which of the following sequencing is correct?

A) $a = b = c$ B) $b = c < a$ C) $c < a = b$
D) $c < a < b$ E) $c < b < a$

15. $\left.\begin{array}{l} a=\sin 15° \\ b=\cos 70° \\ c=\tan 45° \end{array}\right\}$ ⇒ Aşağıdaki sıralamalardan hangisi doğrudur?

Which of the following sequencing is correct?

A) $b < a < c$ B) $c < a < b$ C) $b < c < a$
D) $a < b < c$ E) $a < c < b$

16. $\left.\begin{array}{l} a=\cos 20° \\ b=\sin 130° \\ c=\tan 130° \end{array}\right\}$ ⇒ Aşağıdaki sıralamalardan hangisi doğrudur?

Which of the following sequencing is correct?

A) $a < c < b$ B) $c < b < a$ C) $c < a < b$
D) $b < c < a$ E) $a < b < c$

1. $f(x) = \cos(6x - 3)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) 2π B) $\frac{\pi}{3}$ C) $\frac{\pi}{2}$ D) $\frac{2\pi}{5}$ E) $\frac{2\pi}{3}$

2. $f(x) = 7 \cdot \sin(3x - 4)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) 2π B) π C) $\frac{\pi}{2}$ D) $\frac{2\pi}{3}$ E) $\frac{\pi}{4}$

3. $f(x) = 5 \cdot \tan(2x - 3)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) 2π B) π C) $\frac{\pi}{2}$ D) $\frac{\pi}{3}$ E) $\frac{\pi}{4}$

4. $f(x) = \sin^4(6x + 7)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) $\frac{\pi}{6}$ B) $\frac{\pi}{3}$ C) $\frac{2\pi}{3}$ D) π E) 2π

5. $f(x) = 7 \cdot \tan^5(6 - 4x)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{2\pi}{3}$ D) π E) $\frac{4\pi}{7}$

6. $f(x) = 3 \cdot \cos^5\left(\frac{x}{6} - 7\right)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) $\frac{\pi}{6}$ B) 2π C) 3π D) 6π E) 12π

7. $f(x) = 5 \cdot \sin\left(\frac{x}{3} + 1\right)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) π B) 2π C) 4π D) 6π E) 7π

8. $f(x) = \tan^4\left(\frac{x}{3} + 2\right)$
$f(x) = f(x + T)$
$\Rightarrow \min(T) = ?$

A) 3π B) 2π C) $\frac{2\pi}{5}$ D) $\frac{2\pi}{3}$ E) $\frac{4\pi}{3}$

9. $f(x) = 5 - \frac{3}{2} \cdot \cot\left(\frac{x}{3}\right)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) $\frac{\pi}{2}$ B) $\frac{\pi}{\sqrt{3}}$ C) $\sqrt{3}\pi$ D) π E) 3π

10. $f(x) = \frac{3}{5} + 3 \cdot \sin^6\left(\frac{3x - \pi}{7}\right)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) 2π B) $\frac{7\pi}{6}$ C) $\frac{7\pi}{3}$ D) $\frac{3\pi}{2}$ E) $\frac{3\pi}{7}$

11. $f(x) = 3 - 3 \cdot \tan^2\left(\frac{2x + 3\pi}{4}\right)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) $\frac{\pi}{3}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{2}$ D) π E) 2π

12. $f(x) = 4 + 5 \cdot \cot\left(\frac{3x - 6\pi}{2}\right)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) $\frac{\pi}{3}$ B) $\frac{\pi}{2}$ C) $\frac{2\pi}{3}$ D) $\frac{3\pi}{2}$ E) 3π

13. $f(x) = 3 - 4 \cdot \cot^2\left(\frac{5\pi - 3x}{2}\right)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) $\frac{5\pi}{2}$ B) $\frac{3\pi}{2}$ C) π D) $\frac{2\pi}{3}$ E) $\frac{2\pi}{5}$

14. $f(x) = \sin(2x + 3) + \cos^2(5x + 7)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) π B) $\frac{\pi}{2}$ C) $\frac{\pi}{5}$ D) $\frac{2\pi}{5}$ E) 2π

15. $(x) = \cos^6(5x - 5) + \tan(3x - 1)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) $\frac{8\pi}{15}$ B) $\frac{\pi}{15}$ C) π D) 2π E) 8π

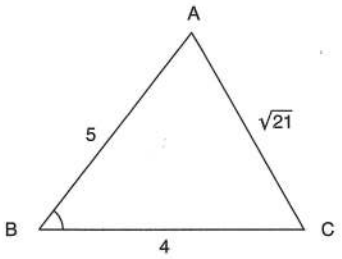
16. $f(x) = \sin(3x - 6) + \cos\left(\frac{6x - 6\pi}{5}\right)$

$f(x) = f(x + T)$

$\Rightarrow \min(T) = ?$

A) $\frac{2\pi}{3}$ B) $\frac{5\pi}{6}$ C) $\frac{10\pi}{3}$ D) $\frac{5\pi}{2}$ E) 4π

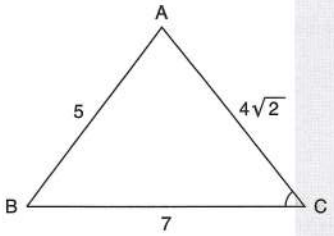
1.



$|AB| = 5$ br
$|BC| = 4$ br
$|AC| = \sqrt{21}$ br
$\Rightarrow m(\widehat{B}) = ?$

A) 15° B) 30° C) 60° D) 90° E) 120°

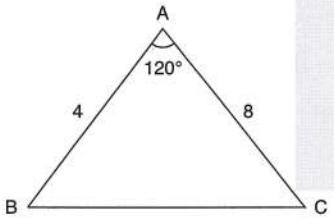
2.



$|AB| = 5$ br
$|BC| = 7$ br
$|AC| = 4\sqrt{2}$ br
$\Rightarrow m(\widehat{C}) = ?$

A) 15° B) 30° C) 45° D) 60° E) 90°

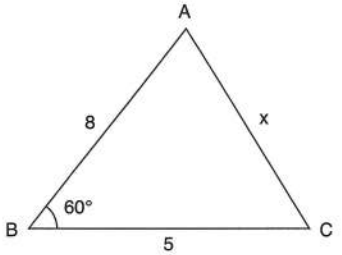
3.



$|AB| = 4$ br
$|AC| = 8$ br
$m(\widehat{A}) = 120°$
$\Rightarrow |BC| = ?$

A) $2\sqrt{23}$ B) $\sqrt{29}$ C) $3\sqrt{17}$ D) 12 E) $4\sqrt{7}$

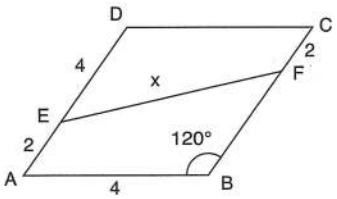
4.



$|AB| = 8$ br
$|BC| = 5$ br
$m(\widehat{B}) = 60°$
$|AC| = x$ br
$\Rightarrow x = ?$

A) $2\sqrt{3}$ B) 5 C) 7 D) $\sqrt{57}$ E) 9

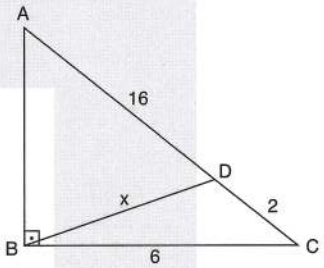
5.



ABCD paralelkenar
ABCD parallelogram
$|AB| = 4$ br
$|DE| = 4$ br
$|EA| = 2$ br
$|CF| = 2$ br
$m(\widehat{B}) = 120°$
$\Rightarrow |EF| = x = ?$

A) $2\sqrt{7}$ B) $\sqrt{35}$ C) 6 D) $2\sqrt{10}$ E) 7

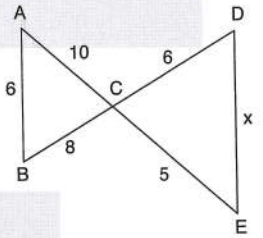
6.



$[AB] \perp [BC]$
$|AD| = 16$ br
$|DC| = 2$ br
$|BC| = 6$ br
$|BD| = x$ br
$\Rightarrow x = ?$

A) $\sqrt{5}$ B) 4 C) $3\sqrt{2}$ D) $2\sqrt{5}$ E) $4\sqrt{2}$

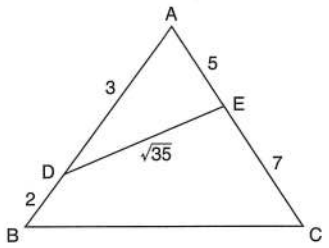
7.



$[AE] \cap [BD] = \{C\}$
$|AB| = 6$ br
$|BC| = 8$ br
$|AC| = 10$ br
$|CD| = 6$ br
$|CE| = 5$ br
$|DE| = x$ br
$\Rightarrow x = ?$

A) $\sqrt{13}$ B) 4 C) $\sqrt{17}$ D) $2\sqrt{5}$ E) 5

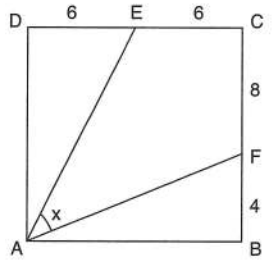
8.



$|AD| = 3$ br
$|DB| = 2$ br
$|DE| = \sqrt{35}$ br
$|AE| = 5$ br
$|EC| = 7$ br
$\Rightarrow |BC| = ?$

A) 6 B) $\sqrt{30}$ C) $3\sqrt{3}$ D) $\sqrt{157}$ E) $\sqrt{173}$

9.



ABCD kare

ABCD square

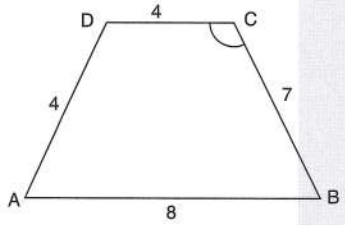
$|DE| = |EC| = 6$ br

$2 \cdot |BF| = |CF| = 8$ br

$\Rightarrow m(\widehat{EAF}) = x = ?$

A) 15° B) 30° C) 45° D) 60° E) 75°

10.



ABCD yamuk

ABCD trapezoid

$|DC| = 4$ br

$|AD| = 4$ br

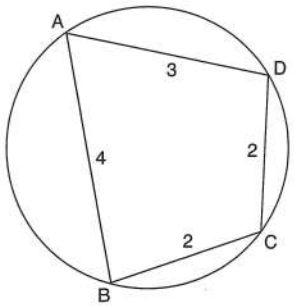
$|AB| = 8$ br

$|BC| = 7$ br

$\Rightarrow \cos(\widehat{C}) = ?$

A) $\frac{7}{8}$ B) $\frac{4}{5}$ C) 1 D) $-\frac{4}{5}$ E) $-\frac{7}{8}$

11.



$|AB| = 4$ br

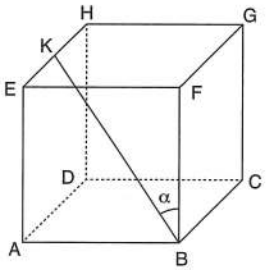
$|AD| = 3$ br

$|BC| = |DC| = 2$ br

$\Rightarrow \cos(\widehat{C}) = ?$

A) $-\frac{1}{8}$ B) $-\frac{15}{32}$ C) $-\frac{1}{2}$ D) $-\frac{17}{32}$ E) $-\frac{19}{32}$

12.



ABCDEFGH küp

ABCDEFGH cube

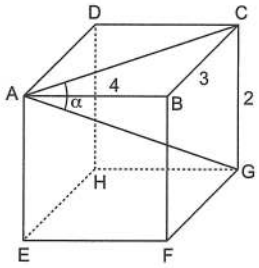
$|KH| = 2 \cdot |EK|$

$m(\widehat{KBF}) = \alpha$

$\Rightarrow \sin\alpha = ?$

A) $\frac{3}{\sqrt{19}}$ B) $\frac{\sqrt{5}}{\sqrt{19}}$ C) $\frac{\sqrt{10}}{\sqrt{19}}$ D) $\frac{2}{3}$ E) $\frac{1}{3}$

13.



ABCDEFGH dikdörtgenler prizması *(rectangular prism)*

$|BC| = 3$ br

$|AB| = 4$ br

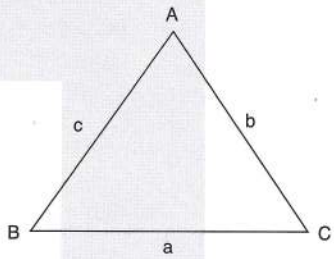
$|GC| = 2$ br

$m(\widehat{CAG}) = \alpha$

$\Rightarrow \cos\alpha = ?$

A) $\frac{2}{\sqrt{5}}$ B) $\frac{3}{\sqrt{5}}$ C) $\frac{4}{5}$ D) $\frac{5}{\sqrt{29}}$ E) $\frac{4}{\sqrt{29}}$

14.

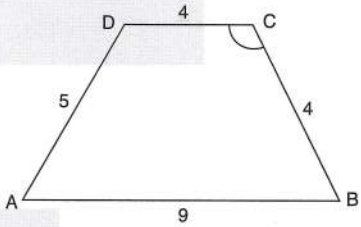


$a^2 = b^2 + c^2 - b \cdot c$

$\Rightarrow \cos(\widehat{A}) = ?$

A) $\frac{1}{2}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{\sqrt{3}}{2}$ D) 1 E) $-\frac{\sqrt{2}}{2}$

15.



ABCD yamuk

ABCD trapezoid

$|DC| = 4$ br

$|AD| = 5$ br

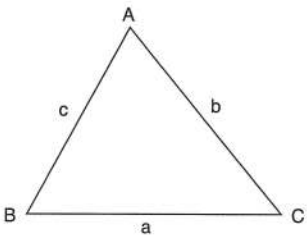
$|AB| = 9$ br

$|BC| = 4$ br

$\Rightarrow \cos\widehat{C} = ?$

A) $\frac{1}{2}$ B) $\frac{2}{5}$ C) $\frac{5}{\sqrt{21}}$ D) $-\frac{2}{5}$ E) $-\frac{1}{2}$

16.



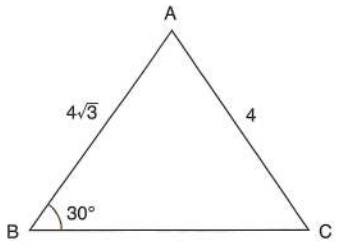
$a \neq c$

$a^3 - c^3 = ab^2 - cb^2$

$\Rightarrow \cos\widehat{B} = ?$

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) 1 D) $-\frac{\sqrt{3}}{2}$ E) $-\frac{1}{2}$

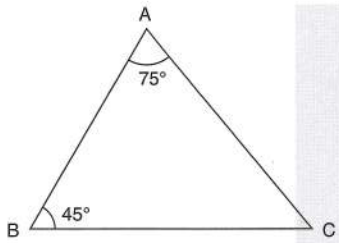
1.



$|AB| = 4\sqrt{3}$ br
$|AC| = 4$ br
$m(\widehat{ABC}) = 30°$
$\Rightarrow m(\widehat{C}) = ?$

A) 15° B) 30° C) 45° D) 60° E) 75°

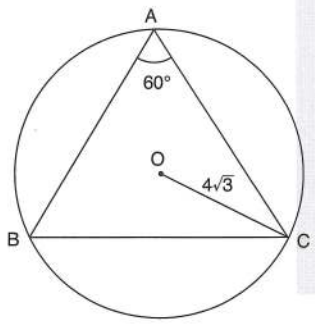
2.



$m(\widehat{BAC}) = 75°$
$m(\widehat{ABC}) = 45°$
$|AC| = 6$ br
$\Rightarrow |AB| = ?$

A) $3\sqrt{2}$ B) $3\sqrt{6}$ C) 10 D) $6\sqrt{3}$ E) 15

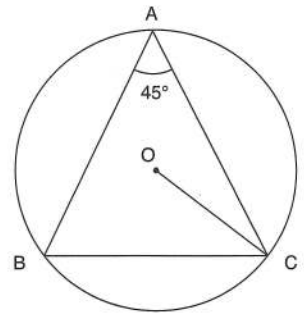
3.



O merkez
O center
$m(\widehat{A}) = 60°$
$|OC| = 4\sqrt{3}$ br
$\Rightarrow |BC| = ?$

A) 4 B) 6 C) $6\sqrt{3}$ D) 12 E) $12\sqrt{3}$

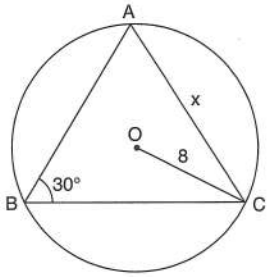
4.



O merkez
O center
$m(\widehat{A}) = 45°$
$|BC| = 4\sqrt{2}$ br
$|OC| = r$ br
$\Rightarrow r = ?$

A) 2 B) 4 C) 6 D) 8 E) 10

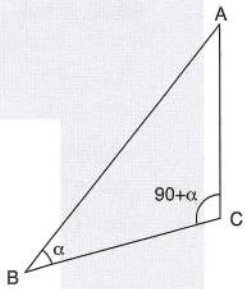
5.



O merkez
O center
$m(\widehat{B}) = 30°$
$|OC| = 8$ br
$|AC| = x$ br
$\Rightarrow x = ?$

A) 4 B) 6 C) 8 D) 12 E) 16

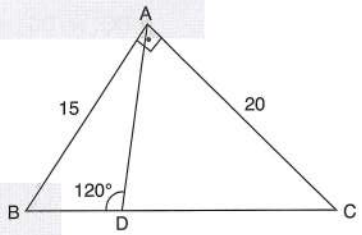
6.



$|AC| = 3$ br
$|AB| = 9$ br
$m(\widehat{ABC}) = \alpha$
$m(\widehat{BCA}) = 90 + \alpha$
$\Rightarrow \sin\alpha = ?$

A) $\frac{1}{4}$ B) $\frac{1}{\sqrt{10}}$ C) $\frac{3}{\sqrt{10}}$ D) $\frac{1}{3\sqrt{10}}$ E) $\frac{1}{2}$

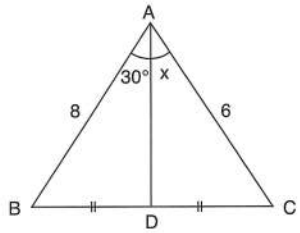
7.



$|AB| = 15$ br
$|AC| = 20$ br
$m(\widehat{ADB}) = 120°$
$\Rightarrow |AD| = ?$

A) $4\sqrt{3}$ B) $6\sqrt{3}$ C) 6 D) $8\sqrt{3}$ E) 8

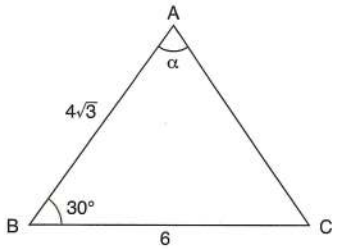
8.



$|AB| = 8$ br
$|AC| = 6$ br
$|BD| = |DC|$
$m(\widehat{BAD}) = 30°$
$m(\widehat{DAC}) = x$
$\Rightarrow \sin x = ?$

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{3}{4}$ E) $\frac{3}{5}$

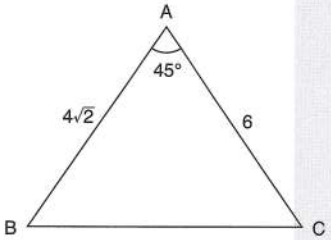
9.



$|AB| = 4\sqrt{3}$ br
$|BC| = 6$ br
$m(\widehat{B}) = 30°$
$m(\widehat{A}) = \alpha$
$\Rightarrow \sin\alpha = ?$

A) 1 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{2}}{2}$ E) $\frac{3}{4}$

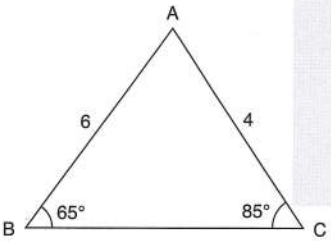
10.



$|AB| = 4\sqrt{2}$ br
$|AC| = 6$ br
$m(\widehat{A}) = 45°$
$\Rightarrow A(ABC) = ?$

A) 12 B) 16 C) 20 D) 24 E) 32

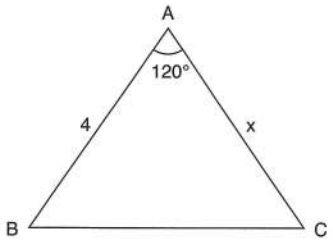
11.



$|AB| = 6$ br
$|AC| = 4$ br
$m(\widehat{B}) = 65°$
$m(\widehat{C}) = 85°$
$\Rightarrow A(ABC) = ?$

A) 6 B) 8 C) 12 D) 16 E) 24

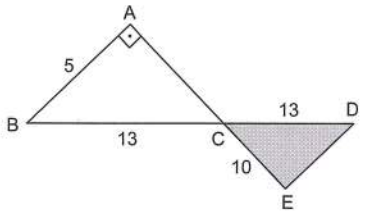
12.



$m(\widehat{BAC}) = 120°$
$|AB| = 4$ br
$|AC| = x$ br
$A(ABC) = 6\sqrt{3}\ br^2$
$\Rightarrow x = ?$

A) 4 B) 6 C) $6\sqrt{3}$ D) 8 E) $8\sqrt{3}$

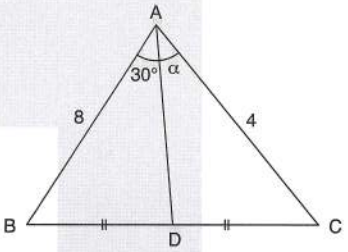
13.



$|AB| = 5$ br
$|BC| = 13$ br
$|CD| = 13$ br
$|CE| = 10$ br
$\Rightarrow A(CDE) = ?$

A) 90 B) 65 C) 30 D) 25 E) 9

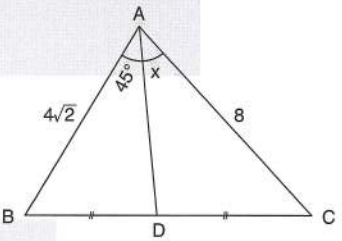
14.



$|AB| = 8$ br
$|AC| = 4$ br
$|BD| = |DC|$
$m(\widehat{BAD}) = 30°$
$m(\widehat{DAC}) = \alpha$
$\Rightarrow \sin\alpha = ?$

A) 1 B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{2}{3}$ E) $\frac{3}{4}$

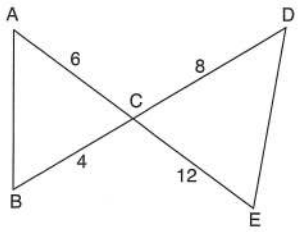
15.



$|BD| = |DC|$
$|AB| = 4\sqrt{2}$ br
$|AC| = 8$ br
$m(\widehat{BAD}) = 45°$
$m(\widehat{DAC}) = x$
$\Rightarrow \sin x = ?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{2}{5}$ D) $\frac{3}{4}$ E) $\frac{3}{5}$

16.



$|AC| = 6$ br
$|BC| = 4$ br
$|CD| = 8$ br
$|CE| = 12$ br
$\Rightarrow \frac{A(ABC)}{A(CDE)} = ?$

A) 2 B) 3 C) 4 D) $\frac{1}{2}$ E) $\frac{1}{4}$

1. $\sin(30° + 45°) = ?$

A) $\frac{\sqrt{6}+\sqrt{2}}{4}$ B) $\frac{\sqrt{6}}{4}$ C) $\frac{\sqrt{2}}{4}$ D) $\frac{\sqrt{6}-\sqrt{2}}{4}$ E) $\frac{\sqrt{3}+\sqrt{2}}{2}$

2. $\sin 15° = ?$

A) $\frac{\sqrt{3}+\sqrt{2}}{2}$ B) $\frac{\sqrt{6}-1}{4}$ C) $\frac{\sqrt{6}-\sqrt{2}}{4}$ D) $\sqrt{6}+\sqrt{2}$ E) $\frac{\sqrt{6}+\sqrt{2}}{2}$

3. $\cos 75° = ?$

A) $\frac{\sqrt{6}-\sqrt{2}}{2}$ B) $\frac{\sqrt{6}-\sqrt{2}}{4}$ C) $\frac{\sqrt{3}-1}{2}$ D) $\frac{\sqrt{6}+\sqrt{2}}{4}$ E) $\frac{\sqrt{2}-1}{2}$

4. $\cos 15° = ?$

A) $\frac{\sqrt{6}}{4}$ B) $\frac{\sqrt{6}+1}{4}$ C) $\frac{\sqrt{6}-\sqrt{2}}{2}$ D) $\frac{\sqrt{6}-1}{4}$ E) $\frac{\sqrt{6}+\sqrt{2}}{4}$

5. $\frac{\cos(x+y)-\cos(x-y)}{\sin(x+y)+\sin(x-y)} + ?$

A) $-\tan y$ B) $-\tan x$ C) $\cos y$ D) 1 E) -1

6. $\frac{\cos\left(x+\frac{\pi}{6}\right)}{\cos\left(x-\frac{\pi}{6}\right)} = 0$

$\Rightarrow \tan x = ?$

A) $\sqrt{3}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) 1 E) $\frac{1}{\sqrt{3}}$

7. $\cot(-15°) = ?$

A) $-2-\sqrt{3}$ B) $1-\sqrt{3}$ C) $1+\sqrt{3}$ D) $2+\sqrt{3}$ E) $\sqrt{3}$

8. $\cos 10° \cdot \cos 50° - \sin 50° \cdot \sin 10° = ?$

A) 0 B) $\frac{1}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{3}}{2}$ E) $\frac{\sqrt{6}}{2}$

9. $\cos 19° \cdot \cos 26° - \sin 19° \cdot \sin 26° = ?$

A) $-\frac{\sqrt{2}}{2}$ B) $-\frac{1}{2}$ C) 0 D) $\frac{\sqrt{2}}{2}$ E) $\cos 3°$

10. $\sin 20° \cdot \cos 40° + \sin 40° \cdot \cos 20° = ?$

A) $-\frac{\sqrt{3}}{2}$ B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{2}$

11. $\cos\frac{\pi}{12} \cdot \cos\frac{\pi}{4} - \sin\frac{\pi}{12} \cdot \sin\frac{\pi}{4} = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

12. $\sin(70° - 3x) \cdot \cos(25° - 3x) - \sin(25° - 3x) \cdot \cos(70° - 3x) = ?$

A) $\sqrt{3}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{1}{2}$ E) 0

13. $x = \frac{\pi}{22}$

$\Rightarrow \frac{\sin(4x) \cdot \cos(3x) + \cos(4x) \cdot \sin(3x)}{\cos(5x) \cdot \cos x + \sin(5x) \cdot \sin x} = ?$

A) $\tan(5x)$ B) -1 C) $\cos(5x)$ D) 1 E) $\sin(5x)$

14. $\cos 20° - \sqrt{3} \cdot \sin 20° = ?$

A) $2\sin 10°$ B) $\frac{1}{2}$ C) $\cos 10°$ D) $\sin 10°$ E) 1

15. $\tan x = \frac{3}{4}$ $\cot y = \frac{1}{2}$

$\Rightarrow \cot(x + y) = ?$

A) $-\frac{1}{11}$ B) $-\frac{2}{11}$ C) $\frac{11}{2}$ D) $\frac{11}{5}$ E) $\frac{2}{11}$

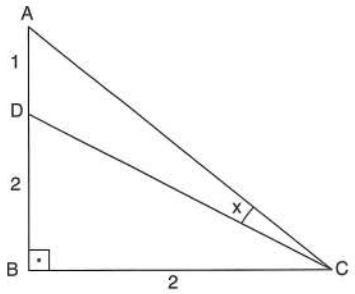
16. $0 < a < 90°$, $0 < b < 90°$

$\tan a = \frac{1}{3}$ $\tan b = \frac{1}{2}$

$\Rightarrow a + b = ?$

A) 15° B) 30° C) 45° D) 60° E) 75°

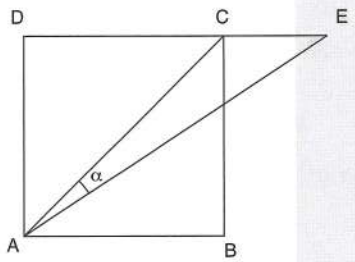
1.



$|AD| = 1$ br
$|DB| = 2$ br
$|BC| = 2$ br
$m(\widehat{DCA}) = ?$
$\Rightarrow \tan x = ?$

A) $\frac{1}{10}$ B) $\frac{2}{10}$ C) $\frac{3}{10}$ D) $\frac{1}{5}$ E) $\frac{2}{5}$

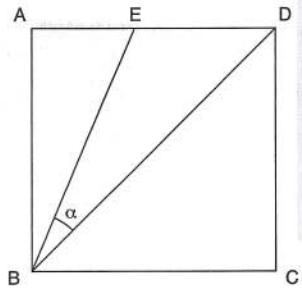
2.



ABCD kare
ABCD square
$|AB| = 3 \cdot |CE|$
$m(\widehat{CAE}) = \alpha$
$\Rightarrow \cot\alpha = ?$

A) 7 B) $\frac{2}{5}$ C) $\frac{1}{5}$ D) $\frac{5}{2}$ E) $\frac{1}{7}$

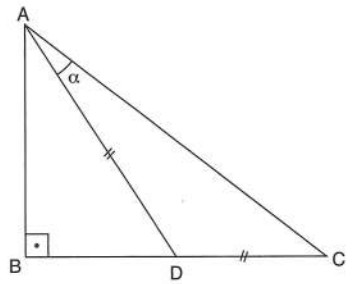
3.



ABCD kare
ABCD square
$2 \cdot |AE| = |ED|$
$m(\widehat{EBD}) = \alpha$
$\Rightarrow \tan\alpha = ?$

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) 3 E) 4

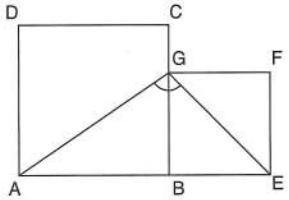
4.



$|AD| = |DC|$
$\tan(\widehat{ADB}) = \frac{4}{3}$
$m(\widehat{DAC}) = \alpha$
$\Rightarrow \cot\alpha = ?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{1}{4}$ D) $\frac{3}{4}$ E) 2

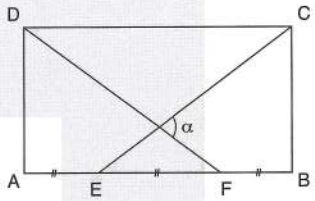
5.



ABCD ve BEFG kare
ABCD and BEFG square
$|AB| = 2 \cdot |BE|$
$\Rightarrow \tan(\widehat{AGE}) = ?$

A) 3 B) $-\frac{3}{2}$ C) $-\frac{1}{2}$ D) $-\frac{2}{3}$ E) -3

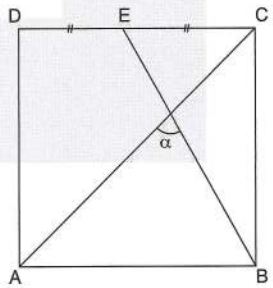
6.



ABCD dikdörtgen
ABCD rectangle
$|AE| = |EF| = |FB|$
$|AD| = 3 \cdot |AE|$
$\Rightarrow \tan\alpha = ?$

A) $-\frac{1}{2\sqrt{3}}$ B) $-\frac{5}{12}$ C) $-\frac{12}{5}$ D) $\frac{5}{12}$ E) $\frac{12}{5}$

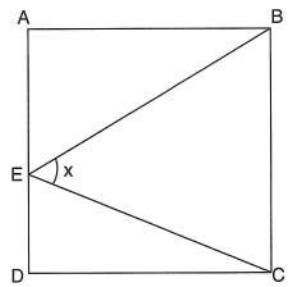
7.



ABCD kare
ABCD square
$|DE| = |EC|$
$\Rightarrow \cot\alpha = ?$

A) $\frac{1}{3}$ B) $\frac{2}{5}$ C) $\frac{1}{2}$ D) $\frac{5}{2}$ E) 3

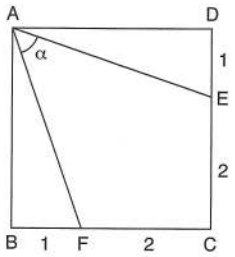
8.



ABCD kare
ABCD square
$2 \cdot |DE| = |AE|$
$m(\widehat{BEC}) = x$
$\Rightarrow \cot x = ?$

A) 1 B) $\frac{7}{9}$ C) $\frac{9}{7}$ D) $\frac{19}{25}$ E) $\frac{25}{19}$

9.



ABCD kare

ABCD square

$|DE| = 1$ br

$|EC| = 2$ br

$|FC| = 2$ br

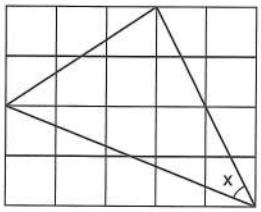
$|BF| = 1$ br

$m(\widehat{EAF}) = \alpha$

$\Rightarrow \tan\alpha = ?$

A) $-\frac{8}{15}$ B) $\frac{1}{8}$ C) $\frac{3}{4}$ D) $\frac{4}{3}$ E) $\frac{8}{15}$

10.



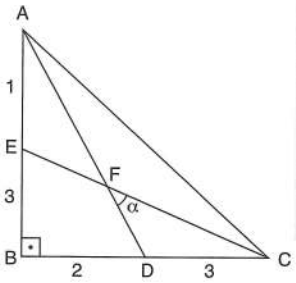
Şekil eş karelerden oluşmuştur.

The figure consists of congruent squares.

$\Rightarrow \cot x = ?$

A) $\frac{8}{7}$ B) $\frac{5}{3}$ C) $\frac{9}{8}$ D) $\frac{10}{7}$ E) $\frac{5}{4}$

11.



$[AB] \perp [BC]$

$|AE| = 1$ br

$|EB| = 3$ br

$|BD| = 2$ br

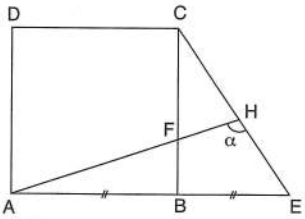
$|DC| = 3$ br

$m(\widehat{DFC}) = \alpha$

$\Rightarrow \cot\alpha = ?$

A) $\frac{11}{7}$ B) $\frac{2}{5}$ C) 1 D) $\frac{5}{2}$ E) $\frac{7}{11}$

12.



ABCD kare

ABCD square

$|AB| = |BE|$

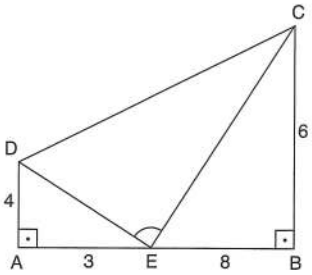
$3 \cdot |BF| = |CF|$

$m(\widehat{AHE}) = \alpha$

$\Rightarrow \tan\alpha = ?$

A) $\frac{3}{5}$ B) $\frac{5}{3}$ C) $\frac{5}{2}$ D) $\frac{2}{5}$ E) $-\frac{5}{3}$

13.



$[AD] \perp [AB]$

$[BC] \perp [AB]$

$|EB| = 8$ br

$|BC| = 6$ br

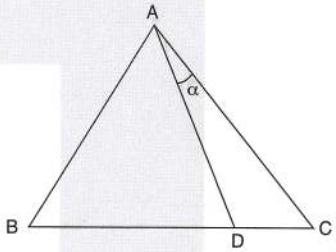
$|AD| = 4$ br

$|AE| = 3$ br

$\Rightarrow \sin(\widehat{DEC}) = ?$

A) $\frac{3}{4}$ B) $\frac{4}{3}$ C) $\frac{3}{5}$ D) 1 E) $-\frac{4}{3}$

14.



ABC eşkenar üçgen

ABC equilateral triangle

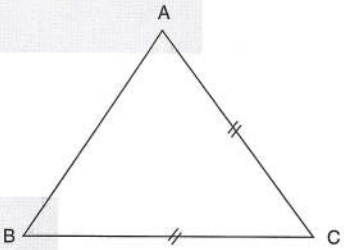
$|BD| = 2 \cdot |DC|$

$m(\widehat{DAC}) = \alpha$

$\Rightarrow \tan\alpha = ?$

A) $\frac{-\sqrt{3}}{5}$ B) $-\frac{1}{\sqrt{3}}$ C) $\frac{1}{\sqrt{3}}$ D) 1 E) $\frac{\sqrt{3}}{5}$

15.



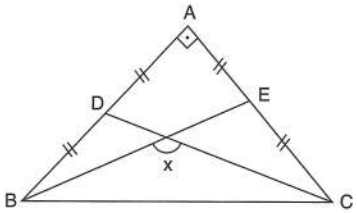
$|AC| = |BC|$

$\tan\widehat{C} = \frac{4}{3}$

$\Rightarrow \tan\widehat{A} = ?$

A) $\frac{3}{4}$ B) $\frac{1}{2}$ C) 2 D) $\frac{4}{3}$ E) $-\frac{3}{4}$

16.



$[AB] \perp [AC]$

$|AB| = |AC|$

$|AD| = |DB|$

$|AE| = |EC|$

$\Rightarrow \cos x = ?$

A) $-\frac{3}{5}$ B) $-\frac{1}{2}$ C) $-\frac{1}{3}$ D) $-\frac{2}{5}$ E) $-\frac{4}{5}$

1. $x \in \left(0, \frac{\pi}{2}\right)$

$\cos x = \frac{4}{5}$

$\Rightarrow \sin(2x) = ?$

A) $\frac{3}{5}$ B) $\frac{4}{5}$ C) $\frac{9}{25}$ D) $\frac{12}{25}$ E) $\frac{24}{25}$

2. $x \in \left(\frac{\pi}{2}, \pi\right)$, $\tan x = -\frac{3}{\sqrt{7}}$

$\Rightarrow \cos(2x) = ?$

A) $\frac{1}{8}$ B) $-\frac{1}{8}$ C) $-\frac{3}{5}$ D) $-\frac{1}{16}$ E) $-\frac{3}{16}$

3. $x \in \left(\pi, \frac{3\pi}{2}\right)$ $\tan x = \frac{4}{3}$

$\Rightarrow \cos(2x) = ?$

A) $-\frac{16}{25}$ B) $-\frac{9}{25}$ C) $-\frac{7}{25}$ D) $-\frac{4}{5}$ E) $-\frac{3}{5}$

4. $2 \cdot \sin x - \cos x = 0$

$\Rightarrow \sin(2x) = ?$

A) $-\frac{2}{5}$ B) $-\frac{1}{5}$ C) $\frac{4}{5}$ D) 1 E) $\frac{5}{4}$

5. $\tan x = 3$

$\Rightarrow \tan(2x) = ?$

A) 4 B) $\frac{4}{3}$ C) $-\frac{3}{4}$ D) $-\frac{4}{3}$ E) $-\frac{5}{4}$

6. $\cos x - \sqrt{3} \cdot \sin x = 0$

$\Rightarrow \cot(2x) = ?$

A) $-\sqrt{3}$ B) $-\frac{1}{\sqrt{3}}$ C) 1 D) $\frac{1}{\sqrt{3}}$ E) $\sqrt{3}$

7. $2\sin 15° \cdot \cos 15° = ?$

A) $-\frac{\sqrt{3}}{2}$ B) $-\frac{1}{2}$ C) 1 D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{2}$

8. $\sin 75° \cdot \cos 75° = ?$

A) $\frac{\sqrt{3}}{4}$ B) $\frac{\sqrt{2}}{4}$ C) $\frac{1}{4}$ D) $-\frac{1}{4}$ E) $-\frac{\sqrt{3}}{4}$

9. $\sin\frac{\pi}{6}\cdot\cos\frac{\pi}{6}=?$

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $\frac{\sqrt{3}}{2}$ E) $\frac{\sqrt{3}}{4}$

10. $4\cdot\sin15^\circ\cdot\cos15^\circ\cdot\cos30^\circ\cdot\cos60^\circ=?$

A) $-\frac{\sqrt{3}}{8}$ B) $-\frac{\sqrt{3}}{4}$ C) $\frac{\sqrt{2}}{4}$ D) $\frac{\sqrt{3}}{4}$ E) $\frac{1}{4}$

11. $\frac{\cos60^\circ}{\sin15^\circ}+\frac{\sin60^\circ}{\cos15^\circ}=?$

A) $2\sqrt{2}$ B) $\sqrt{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{2}}{4}$ E) $\frac{1}{4}$

12. $\frac{\cos63^\circ}{\sin9^\circ}-\frac{\sin63^\circ}{\cos9^\circ}=?$

A) $\sin9^\circ$ B) $\cos9^\circ$ C) $\sin18^\circ$ D) 2 E) 1

13. $\frac{\sin(6x)}{\sin(2x)}+\frac{\cos(6x)}{\cos(2x)}=?$

A) $4\cos(4x)$ B) $2\cos(4x)$ C) $\cos(4x)$ D) 4 E) 2

14. $\frac{\sin12^\circ+\sin24^\circ}{\cos24^\circ+\cos12^\circ+1}=?$

A) $\cot12^\circ$ B) 1 C) $\tan12^\circ$ D) $\sec12^\circ$ E) -1

15. $\frac{\sin x}{\cos x+\sin x}=\frac{1}{5}$

$\Rightarrow \sin(2x)=?$

A) $\frac{2}{17}$ B) $\frac{3}{17}$ C) $\frac{7}{10}$ D) $\frac{8}{\sqrt{17}}$ E) $\frac{8}{17}$

16. $\frac{1}{\sin15^\circ}+\frac{\sqrt{3}}{\cos15^\circ}=?$

A) $4\sqrt{2}$ B) $2\sqrt{2}$ C) $\frac{\sqrt{2}}{2}$ D) 4 E) 8

1. $\sin 10° = x$

$\Rightarrow \sin 70° = ?$

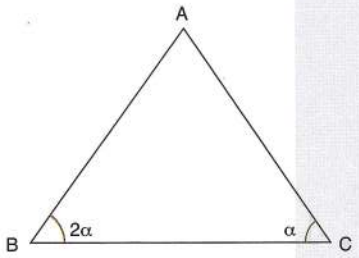
A) x^2 B) $-x^2$ C) $1 - 2x^2$ D) $x^2 + 1$ E) $1 - x^2$

2. $\cos 20° = a$

$\Rightarrow \sin 50° = ?$

A) a^2 B) $2a^2$ C) $2a^2 + 1$ D) $2a^2 - 1$ E) $1 - 2a^2$

3.



$|AB| = 6$ br

$|AC| = 8$ br

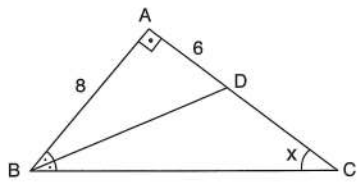
$m(\widehat{B}) = 2\alpha$

$m(\widehat{C}) = \alpha$

$\Rightarrow \cos\alpha = ?$

A) $\frac{3}{5}$ B) $\frac{4}{5}$ C) $\frac{2}{3}$ D) $\frac{3}{8}$ E) $\frac{2}{9}$

4.



$|AB| = 8$ cm

$|AD| = 6$ cm

$m(\widehat{BCA}) = x$

$m(\widehat{ABD}) = m(\widehat{DBC})$

$\Rightarrow \sin x = ?$

A) $\frac{1}{5}$ B) $\frac{7}{25}$ C) $\frac{4}{25}$ D) $\frac{5}{7}$ E) $\frac{5}{12}$

5. $\dfrac{\cos^3 75° - \sin^3 75°}{\cos 75° - \sin 75°} = ?$

A) $\frac{1}{4}$ B) $\frac{3}{2}$ C) $\frac{5}{4}$ D) $\frac{4}{5}$ E) $\frac{3}{4}$

6. $\cos^4 15° - \sin^4 15° = ?$

A) $-\frac{\sqrt{3}}{3}$ B) $-\frac{\sqrt{3}}{2}$ C) $-\frac{1}{2}$ D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{2}$

7. $\sin x - \cos x = \frac{1}{3}$

$\Rightarrow \sin(2x) = ?$

A) $\frac{3}{4}$ B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) $\frac{1}{3}$ E) $\frac{8}{9}$

8. $\sin x + \cos x = \frac{1}{2}$

$\Rightarrow \cos^3 x + \sin^3 x = ?$

A) $\frac{5}{16}$ B) $\frac{5}{8}$ C) $\frac{3}{16}$ D) $\frac{11}{16}$ E) 1

9. $x \in \left(0, \frac{\pi}{2}\right)$

$\tan x - \cot x = -\frac{5}{6}$

$\Rightarrow \cot(2x) + \tan(2x) = ?$

A) $\frac{25}{69}$ B) $\frac{15}{69}$ C) $\frac{159}{60}$ D) $\frac{163}{60}$ E) $\frac{169}{60}$

10. $\sin 10° \cdot \sin 50° \cdot \sin 70° = ?$

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) $\frac{1}{16}$ E) $\frac{1}{32}$

11. $0 < \alpha < \frac{\pi}{2}$

$\Rightarrow \sqrt{4\cos(2\alpha) + 4} = ?$

A) $2\cos\alpha$ B) $\cos\alpha$ C) $4\cos\alpha$ D) $2\sqrt{2}\cos\alpha$ E) $4\sin\alpha$

12. $0 < x < 45°$

$\sin(2x) = \frac{4}{5}$

$\Rightarrow \tan x = ?$

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 1 D) 2 E) $\frac{3}{2}$

13. $0 < \alpha < \frac{\pi}{4}$

$\sin(2\alpha) = \frac{12}{13}$

$\Rightarrow \tan\alpha + \cot\alpha = ?$

A) $\frac{6}{13}$ B) $\frac{5}{6}$ C) 1 D) $\frac{6}{5}$ E) $\frac{13}{6}$

14. $0 < x < 90°$

$\cos x = \frac{1}{3}$

$\Rightarrow \tan\left(\frac{x}{2}\right) = ?$

A) $\frac{4}{5}$ B) $\frac{3}{5}$ C) $\frac{\sqrt{2}}{2}$ D) $\sqrt{2}$ E) $2\sqrt{2}$

15. $\tan 75° = ?$

A) $2-\sqrt{3}$ B) $2+\sqrt{3}$ C) $1+\sqrt{3}$ D) $\frac{\sqrt{3}}{3}$ E) $2\sqrt{3}+2$

16. $\frac{\pi}{2} < x < \pi$

$\cot x = -\frac{4}{3}$

$\Rightarrow \sin\left(\frac{x}{2}\right) = ?$

A) $-\frac{3}{\sqrt{10}}$ B) $-\frac{1}{\sqrt{10}}$ C) $\frac{1}{\sqrt{10}}$ D) $\frac{3}{\sqrt{10}}$ E) $\frac{4}{\sqrt{10}}$

1. $\sin 75° + \sin 15° = ?$

A) $\frac{\sqrt{2}}{2}$ B) $\frac{\sqrt{3}}{4}$ C) $\frac{\sqrt{6}}{2}$ D) $\frac{\sqrt{6}}{4}$ E) $\frac{2\sqrt{6}}{3}$

2. $\cos 15° - \sin 105° = ?$

A) $-\frac{\sqrt{3}}{2}$ B) 0 C) $\frac{1}{2}$ D) $\frac{\sqrt{3}}{4}$ E) $\frac{\sqrt{3}}{2}$

3. $\frac{\sin 33° + \sin 57°}{\cos 48° + \cos 72°} = ?$

A) $-\sqrt{2}$ B) $-\frac{\sqrt{2}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\sqrt{2}$ E) $2\sqrt{2}$

4. $\frac{\sin(2x) + \sin x}{\cos(2x) + \cos x} = ?$

A) 1 B) $\tan\left(\frac{3x}{2}\right)$ C) $\cot\left(\frac{3x}{2}\right)$ D) $\sin\left(\frac{x}{2}\right)$ E) -1

5. $a = \frac{\pi}{36}$

$\Rightarrow \frac{\cos(15a) + \cos(2a)}{\sin(16a) + \sin(3a)} = ?$

A) -1 B) 0 C) 1 D) $\sqrt{3}$ E) $\frac{1}{\sqrt{3}}$

6. $\frac{\sin^2 33° - \sin^2 27°}{\sin 6°} = ?$

A) $\frac{\sqrt{3}}{2}$ B) 1 C) $\frac{1}{2}$ D) $\frac{1}{4}$ E) $\frac{\sqrt{2}}{2}$

7. $\frac{1}{\sin 15°} - \frac{1}{\cos 15°} = ?$

A) $\sqrt{2}$ B) $2\sqrt{2}$ C) $\sin 15°$ D) $\cos 15°$ E) $\frac{1}{2}$

8. $\frac{\cos 15° + \cos 30° + \cos 45°}{\sin 15° + \sin 30° + \sin 45°} = ?$

A) 1 B) $\sqrt{2}$ C) $\sqrt{3}$ D) $\frac{1}{\sqrt{3}}$ E) $\frac{\sqrt{3}}{2}$

9. $\dfrac{\cos(3x)+\cos(5x)+\cos(7x)}{\sin(3x)+\sin(5x)+\sin(7x)} = ?$

A) cot(5x) B) tan(5x) C) sin(5x) D) cos(5x) E) 1

10. $\dfrac{\cos 47° + \sin 17°}{\sin 77°} = ?$

A) 1 B) $\sqrt{2}$ C) $\sqrt{3}$ D) 2 E) 3

11. $\cos 75° \cdot \cos 15° = ?$

A) $-\dfrac{1}{4}$ B) $-\dfrac{1}{2}$ C) $\dfrac{1}{2}$ D) $\dfrac{1}{4}$ E) $\dfrac{3}{4}$

12. $2 \cdot \cos 64° \cdot \cos 26° = ?$

A) cos48° B) 0 C) $\dfrac{\sqrt{3}-1}{2}$ D) $\dfrac{1}{2} \cdot \sin 52°$ E) sin52°

13. $x = \dfrac{\pi}{12}$

$\Rightarrow \cos(6x) \cdot \cos(2x) = ?$

A) $-\dfrac{\sqrt{3}}{2}$ B) $-\dfrac{3}{4}$ C) $\dfrac{1}{2}$ D) $\dfrac{\sqrt{3}}{2}$ E) 0

14. $32x = \pi$

$\Rightarrow \sin(16x) \cdot \cos(8x) = ?$

A) $-\dfrac{1}{2}$ B) $-\dfrac{\sqrt{2}}{2}$ C) 0 D) $\dfrac{1}{2}$ E) $\dfrac{\sqrt{2}}{2}$

15. $\tan(2\alpha) = \dfrac{1}{3}$

$\Rightarrow 2 \cdot \cos\left(\dfrac{3\alpha}{2}\right) \cdot \cos\left(\dfrac{5\alpha}{2}\right) - \cos\alpha = ?$

A) $-\dfrac{1}{4}$ B) $-\dfrac{1}{2}$ C) $\dfrac{5}{9}$ D) $\dfrac{7}{25}$ E) $\dfrac{4}{5}$

16. $\dfrac{1}{\cos 20°} - 4 \cdot \cos 40° = ?$

A) –2 B) –1 C) 0 D) $\dfrac{1}{2}$ E) 2

1. $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$

$\arcsin\frac{\sqrt{3}}{2} = x$

$\Rightarrow x = ?$

A) $\frac{\pi}{12}$ B) $\frac{\pi}{6}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{3}$ E) $\frac{\pi}{2}$

2. $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$

$\arcsin\frac{1}{2} = x$

$\Rightarrow x = ?$

A) $\frac{\pi}{2}$ B) $\frac{5\pi}{12}$ C) $\frac{\pi}{3}$ D) $\frac{\pi}{4}$ E) $\frac{\pi}{6}$

3. $0 \le x \le \pi$

$\arccos(-1) = x$

$\Rightarrow x = ?$

A) 0 B) $\frac{5\pi}{6}$ C) $\frac{2\pi}{3}$ D) $\frac{\pi}{4}$ E) π

4. $0 \le x \le \pi$

$\arccos\left(-\frac{\sqrt{3}}{2}\right) = x$

$\Rightarrow x = ?$

A) $\frac{\pi}{3}$ B) $\frac{\pi}{2}$ C) $\frac{2\pi}{3}$ D) $\frac{3\pi}{4}$ E) $\frac{5\pi}{6}$

5. $\cos\left(\arccos\frac{1}{3}\right) = x$

$\Rightarrow x = ?$

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) $\frac{\sqrt{5}}{3}$ E) $\frac{1}{2}$

6. $\cos\left(\arcsin\frac{4}{5}\right) = x$

$\Rightarrow x = ?$

A) $\frac{3}{5}$ B) $\frac{2}{3}$ C) $\frac{4}{5}$ D) $\frac{3}{4}$ E) $\frac{2}{5}$

7. $\sin\left(\arccos\frac{1}{2}\right) = x$

$\Rightarrow x = ?$

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{\sqrt{2}}{3}$ D) $\frac{2\sqrt{2}}{3}$ E) $\frac{\sqrt{3}}{2}$

8. $\arctan\left(\frac{1}{\sqrt{3}}\right) = x$

$\Rightarrow x = ?$

A) $\frac{2\pi}{3}$ B) $\frac{\pi}{2}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{4}$ E) $\frac{\pi}{3}$

9. $\operatorname{arccot}\left(-\frac{1}{\sqrt{3}}\right) = x$

$\Rightarrow x = ?$

A) $-\frac{\pi}{3}$ B) $-\frac{\pi}{6}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{3}$ E) $\frac{2\pi}{3}$

10. $\tan(\operatorname{arccot} 2) = x$

$\Rightarrow x = ?$

A) 2 B) $\frac{1}{2}$ C) 3 D) $\frac{3}{4}$ E) $\frac{4}{3}$

11. $\arcsin\frac{\sqrt{3}}{2} + \arctan(-1) = ?$

A) $\frac{\pi}{12}$ B) $\frac{\pi}{6}$ C) $\frac{\pi}{3}$ D) $\frac{5\pi}{12}$ E) $\frac{\pi}{2}$

12. $\cot\left(\pi - \arccos\frac{4}{5}\right) = x$

$\Rightarrow x = ?$

A) $-\frac{4}{3}$ B) $\frac{3}{5}$ C) $\frac{3}{4}$ D) $\frac{4}{3}$ E) $\frac{5}{4}$

13. $\sin\left(\frac{3\pi}{2} - 2\arctan\frac{1}{2}\right) = x$

$\Rightarrow x = ?$

A) $-\frac{4}{5}$ B) $-\frac{3}{5}$ C) $\frac{1}{5}$ D) $\frac{3}{5}$ E) $\frac{4}{5}$

14. $\sin\left(2\arcsin\frac{\sqrt{3}}{2}\right) = x$

$\Rightarrow x = ?$

A) $\frac{1}{2}$ B) $\frac{\sqrt{2}}{3}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{3}}{2}$ E) 1

15. $\sin\left(\arccos\frac{\sqrt{3}}{2} + \arccos\frac{1}{2}\right) = x$

$\Rightarrow x = ?$

A) -1 B) $-\frac{\sqrt{3}}{2}$ C) $\sqrt{3}$ D) $\frac{\sqrt{3}}{2}$ E) 1

16. $\sin\left(\operatorname{arccot}\frac{4}{3} - \arctan\frac{12}{5}\right) = x$

$\Rightarrow x = ?$

A) $-\frac{12}{65}$ B) $-\frac{33}{65}$ C) $\frac{16}{65}$ D) $\frac{32}{65}$ E) $\frac{56}{65}$

1. $0 \le x < 360°$

$\sin x = \frac{\sqrt{3}}{2}$ $\Rightarrow$ S.S. = ?

A) {30°, 120°} B) {30°, 150°} C) {60°, 120°} D) {60°, 150°} E) {45°, 135°}

2. $2 \cdot \sin x = 1$

$\Rightarrow$ S.S. = ?

A) $\left\{\frac{\pi}{3} + 2k\pi,\ \frac{2\pi}{3} + 2k\pi;\ k \in Z\right\}$

B) $\left\{\frac{\pi}{6} + 2k\pi,\ \frac{5\pi}{6} + 2k\pi,\ k \in Z\right\}$

C) $\left\{\frac{\pi}{3} + 2k\pi,\ \frac{4\pi}{3} + 2k\pi,\ k \in Z\right\}$

D) $\left\{\frac{\pi}{6} + 2k\pi,\ \frac{7\pi}{6} + 2k\pi,\ k \in Z\right\}$

E) $\left\{\frac{2\pi}{3} + 2k\pi,\ \frac{4\pi}{3} + 2k\pi,\ k \in Z\right\}$

3. $0 \le x < 2\pi$

$2\sin^2 x + \sin x - 1 = 0$

$\Rightarrow$ S.S. = ?

A) $\left\{\frac{\pi}{6}, \frac{5\pi}{6}\right\}$ B) $\left\{\frac{\pi}{6}, \frac{2\pi}{3}\right\}$ C) $\left\{\frac{\pi}{6}, \frac{5\pi}{3}, \frac{3\pi}{2}\right\}$ D) $\left\{\frac{\pi}{3}, \frac{3\pi}{2}\right\}$ E) $\left\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}\right\}$

4. $0 \le x < 90°$

$\sin(3x) = \sin 75°$

$\Rightarrow$ S.S. = ?

A) {25°} B) {25°, 35°} C) {25°, 85°} D) {50°, 85°} E) {25°, 35°, 85°}

5. $0 \le x < 360°$

$2 \cdot \cos x - \sqrt{2} = 0$

$\Rightarrow$ S.S. = ?

A) {30°, 150°} B) {30°, 210°} C) {45°, 315°} D) {45°, 135°} E) {45°, 225°}

6. $0 \le x < 2\pi$

$2 \cdot \cos^2 x + \cos x - 10 = 0$

$\Rightarrow$ S.S. = ?

A) $\left\{\frac{\pi}{3}, \pi\right\}$ B) $\left\{\frac{\pi}{3}, \frac{\pi}{6}\right\}$ C) $\left\{\frac{\pi}{3}, \frac{2\pi}{3}, \pi\right\}$ D) $\left\{\frac{\pi}{3}, \pi, \frac{5\pi}{3}\right\}$ E) Ø

7. $0 \le x < 360°$

$2 \cdot \cos^2 x + 9 \cdot \cos x - 5 = 0$

$\Rightarrow$ S.S. = ?

A) $\left\{\frac{\pi}{3}, \frac{2\pi}{3}\right\}$ B) $\left\{\frac{\pi}{6}, \frac{5\pi}{6}\right\}$ C) $\left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$ D) $\left\{\frac{\pi}{6}, \frac{11\pi}{6}\right\}$ E) $\left\{\frac{\pi}{3}, \frac{11\pi}{6}\right\}$

8. $0 \le x < \frac{\pi}{8}$

$\cos\left(3x - \frac{\pi}{4}\right) = \sin\left(\frac{\pi}{2} + x\right)$

$\Rightarrow x = ?$

A) $\frac{\pi}{12}$ B) $\frac{\pi}{16}$ C) $\frac{\pi}{20}$ D) $\frac{\pi}{24}$ E) $\frac{\pi}{36}$

9. $0 \le x < 360°$

$\tan x = \frac{\sqrt{3}}{3}$

$\Rightarrow$ S.S. = ?

A) {60°, 120°} B) {60°, 240°} C) {30°, 210°} D) {60°, 300°} E) {240°, 300°}

10. $0 \le x < 90°$

$\frac{\cos x + \cos(3x) + \cos(5x)}{\sin x + \sin(3x) + \sin(5x)} = \frac{\sqrt{3}}{3}$

$\Rightarrow$ S.S. = ?

A) {20°} B) {30°} C) {40°} D) {20°, 60°} E) {20°, 80°}

11. $0 \le x < 180°$

$\tan(7x + 20°) = \tan(5x + 60°)$

$\Rightarrow$ S.S. = ?

A) {20°, 110°} B) {70°, 120°} C) {70°, 160°} D) {80°, 130°} E) {50°, 140°}

12. $\cot x = -1$

$\Rightarrow$ S.S. = ?

A) $\left\{\frac{3\pi}{4} + k\pi,\ k \in Z\right\}$ B) $\left\{\frac{\pi}{4} + k\pi,\ k \in Z\right\}$

C) $\left\{\frac{5\pi}{4} + k\pi,\ k \in Z\right\}$ D) $\left\{\frac{\pi}{3} + k\pi,\ k \in Z\right\}$

E) $\left\{\frac{\pi}{6} + k\pi,\ k \in Z\right\}$

13. $0 \le x < \pi$

$\cot(6x) = \cot\left(4x + \frac{\pi}{3}\right)$

$\Rightarrow$ S.S. = ?

A) $\left\{\frac{\pi}{3}, \frac{2\pi}{3}\right\}$ B) $\left\{\frac{\pi}{6}, \frac{3\pi}{2}\right\}$ C) $\left\{\frac{\pi}{6}, \frac{2\pi}{3}\right\}$

D) $\left\{\frac{\pi}{6}, \frac{7\pi}{6}\right\}$ E) $\left\{\frac{\pi}{4}, \frac{2\pi}{3}\right\}$

14. $0 \le x < 2\pi$

$A = 3 \cdot \cos x - 5 \cdot \sin x$

$\Rightarrow \max(A) = ?$

A) 4 B) $\sqrt{17}$ C) 5 D) $\sqrt{34}$ E) 6

15. $0 \le x < 180°$

$\cos x - \sqrt{3} \cdot \sin x = 0$

$\Rightarrow$ S.S. = ?

A) {30°} B) {60°} C) {90°} D) {120°} E) {150°}

16. $\sin x + \sqrt{3} \cdot \cos x = 0$

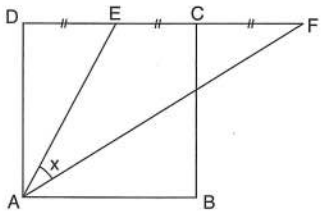
$\Rightarrow$ S.S. = ?

A) $\left\{\frac{2\pi}{3} + k\pi,\ k \in Z\right\}$ B) $\left\{\frac{2\pi}{5} + k\pi,\ k \in Z\right\}$

C) $\left\{\frac{\pi}{6} + k\pi,\ k \in Z\right\}$ D) $\left\{\frac{3\pi}{4} + k\pi,\ k \in Z\right\}$

E) $\left\{\frac{\pi}{3} + k\pi,\ k \in Z\right\}$

1.



ABCD kare

ABCD square

$|DE| = |EC| = |CF|$

$m(\widehat{FAE}) = x$

$\Rightarrow \tan x = ?$

A) $\frac{1}{8}$ B) $\frac{1}{7}$ C) $\frac{1}{6}$ D) $\frac{1}{5}$ E) $\frac{4}{7}$

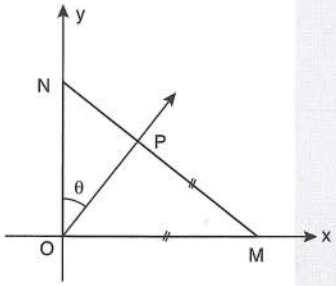
2. $0 \le x < 2\pi$

$3\cos^2 x - 7\cos x + 4 = 0$

$\Rightarrow x = ?$

A) 0 B) $\frac{\pi}{6}$ C) $\frac{\pi}{2}$ D) π E) $\frac{3\pi}{2}$

3.



N(0, 6), M(8, 0)

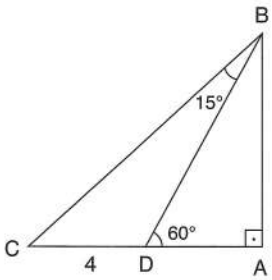
$m(\widehat{PON}) = \theta$

$|MP| = |MO|$

$\Rightarrow \tan\theta = ?$

A) $\sqrt{3}$ B) $\frac{1}{3}$ C) 3 D) $\frac{1}{4}$ E) $\frac{1}{\sqrt{2}}$

4.



$[AB] \perp [AC]$

$m(\widehat{BDA}) = 60°$

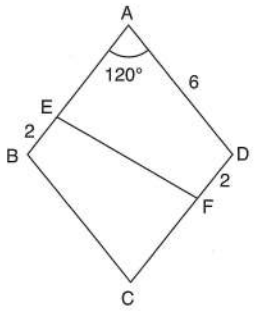
$m(\widehat{DBC}) = 15°$

$|CD| = 4$ br

$\Rightarrow |AB| = ?$

A) $\sqrt{3}$ B) $2\sqrt{3}$ C) 4 D) $6 + 2\sqrt{3}$ E) 12

5.



ABCD eşkenar dörtgen

ABCD rhombus

$|AD| = 6$ br

$m(\widehat{A}) = 120°$

$|BE| = |DF| = 2$ br

$\Rightarrow |EF| = ?$

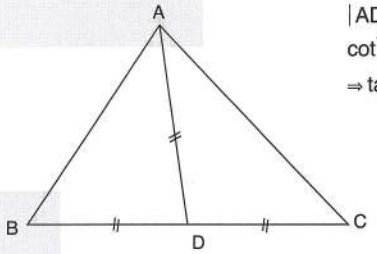
A) $2\sqrt{7}$ B) $\frac{4\sqrt{7}}{3}$ C) $3\sqrt{2}$ D) $2\sqrt{10}$ E) $2\sqrt{13}$

6. $8a = \frac{\pi}{2}$

$\Rightarrow \frac{\cos(3a) + \cos(5a)}{\cos a \cdot \sin(8a)} = ?$

A) -1 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\sqrt{2}$ E) $\frac{\sqrt{2}}{2}$

7.



$|AD| = |BD| = |DC|$

$\cot\widehat{C} = 2$

$\Rightarrow \tan\widehat{B} = ?$

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{3}{2}$ D) 2 E) 3

8.

I. $\sin 105°$
II. $\tan 170°$
III. $\cos 250°$
IV. $\cot 265°$

Bu ifadelerin işaretleri sırasıyla nedir?

What are the signs of these expressions respectively?

A) +, –, +, – B) –, –, –, + C) +, –, –, + D) –, –, –, – E) +, –, –, –

9. $\sin 20° = A$

$\Rightarrow$ A aşağıdakilerden hangisine eşittir?

Which of the following is equal to A?

A) $\sin 70°$ B) $\cos 140°$ C) $\cos 50°$ D) $-\cos 110°$ E) $\cos(-50°)$

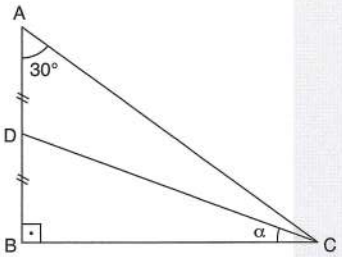
10. $0 \le x \le \frac{\pi}{2}$

$\cot x = \frac{1}{2}$

$\Rightarrow \cos^2 x - \cos x \cdot \sin x = ?$

A) -1 B) $-\frac{1}{3}$ C) $-\frac{1}{5}$ D) 0 E) $\frac{2}{3}$

11.



$[AB] \perp [BC]$

$m(\widehat{BAC}) = 30°$

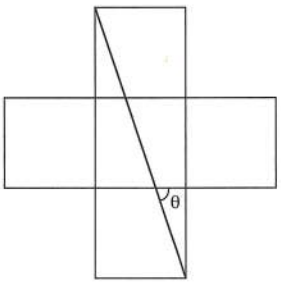
$m(\widehat{DCB}) = \alpha$

$|AD| = |DB|$

$\Rightarrow \tan\alpha = ?$

A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{5}}{2}$ C) $\frac{\sqrt{5}}{3}$ D) $\sqrt{3}$ E) $2\sqrt{3}$

12.



Şekil eş karelerden oluşmuştur.

The figure consists of congruent squares?

$\Rightarrow \cot\theta = ?$

A) $\frac{1}{6}$ B) $\frac{1}{5}$ C) $\frac{1}{4}$ D) $\frac{1}{3}$ E) $\frac{1}{2}$

13. $0 \le x < \frac{\pi}{2}$

$\cot x = \frac{3}{4}$

$\Rightarrow \sin^2 x - \cos^2 x = ?$

A) $\frac{1}{25}$ B) $\frac{2}{25}$ C) $\frac{7}{25}$ D) $\frac{4}{5}$ E) 1

14. $0 \le x < \frac{\pi}{2}$

$\frac{1}{\cos x} = \frac{3}{\sin x}$ $\Rightarrow \cos x = ?$

A) $\frac{1}{3}$ B) 3 C) $\frac{1}{\sqrt{10}}$ D) $\frac{3}{\sqrt{10}}$ E) $\frac{3}{10}$

15. $0 \le x < \frac{\pi}{2}$

$\frac{1}{1-\sin x} - \frac{1}{1+\sin x} = \frac{8}{15}$

$\Rightarrow \sin x = ?$

A) $\frac{2}{3}$ B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $\frac{3}{15}$ E) $\frac{1}{15}$

16. $\cos x - \sin x = \frac{2}{3}$

$\Rightarrow \sin(2x) = ?$

A) $\frac{2}{3}$ B) $\frac{4}{9}$ C) $\frac{5}{9}$ D) $-\frac{1}{2}$ E) $-\frac{2}{3}$

1. $\dfrac{\cos x + \cos(4x) + \cos(7x)}{\sin x + \sin(4x) + \sin(7x)} = ?$

A) 1 B) tan(4x) C) cot(4x) D) cos(4x) E) sin(4x)

2. sin105°, cos195°, tan215°

Bu ifadelerin işaretleri sırasıyla nedir?

What are signs of these expressions respectively?

A) +, –, – B) –, –, + C) –, +, + D) +, +, – E) +, –, +

3. $\cos 36° = \dfrac{\sqrt{5}+1}{4}$

$\Rightarrow \cos 72° = ?$

A) $\dfrac{\sqrt{5}-1}{4}$ B) $\dfrac{\sqrt{3}+2}{4}$ C) $\dfrac{\sqrt{5}}{3}$ D) $\dfrac{\sqrt{3}}{2}$ E) $\dfrac{1}{3}$

4. $0 \le x < \dfrac{\pi}{2}$

$\dfrac{1}{\cos^2 x} + \dfrac{1}{\sin^2 x} = 4$

$\Rightarrow x = ?$

A) $\dfrac{\pi}{8}$ B) $\dfrac{\pi}{6}$ C) $\dfrac{\pi}{5}$ D) $\dfrac{\pi}{4}$ E) $\dfrac{\pi}{3}$

5. $\dfrac{\sin(3x)}{\sin x} + \dfrac{\cos(3x)}{\cos x} = 1$

$\Rightarrow \cos(2x) = ?$

A) 3 B) $\dfrac{1}{3}$ C) $\dfrac{4}{9}$ D) $\dfrac{9}{4}$ E) $\dfrac{1}{4}$

6. $\sin(2x) = a - 1$

$\Rightarrow (\sin x + \cos x)^2 = ?$

A) a B) 2a + 1 C) 2a + 2 D) 2 – a E) $2a^2 + 1$

7. $\cos\left(\dfrac{\pi}{2} + x\right) = \sin\left(\dfrac{\pi}{2} - x\right)$

$\Rightarrow \cot x = ?$

A) $\sqrt{3}$ B) $\dfrac{\sqrt{3}}{3}$ C) $-\dfrac{\sqrt{3}}{3}$ D) $-\sqrt{3}$ E) –1

8. $\dfrac{\cos(2a) + 1}{1 - \sin a} - 2 = ?$

A) 2sina B) cosa C) 2tana D) cota E) sina

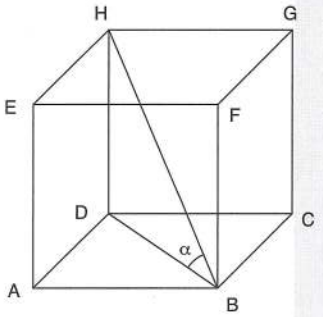
9. $\dfrac{\sin 15° \cdot \cos 45° + \sin 45° \cdot \cos 15°}{\cos 55° \cdot \cos 25° + \sin 55° \cdot \sin 25°} = ?$

A) $\sqrt{2}$ B) $\sqrt{3}$ C) $\dfrac{\sqrt{3}}{2}$ D) $\dfrac{1}{2}$ E) 1

10. $\cos\left(\text{arccot}\dfrac{1}{2}\right) = ?$

A) $\dfrac{1}{\sqrt{5}}$ B) $\dfrac{2}{\sqrt{5}}$ C) $-\dfrac{1}{\sqrt{5}}$ D) $-\dfrac{2}{\sqrt{5}}$ E) -1

11.



ABCDEFGH küp

ABCDEFGH Cube

$m(\widehat{DBH}) = \alpha$

$\Rightarrow \cot\alpha = ?$

A) $\dfrac{\sqrt{2}}{2}$ B) $\dfrac{\sqrt{3}}{2}$ C) $\dfrac{1}{\sqrt{3}}$ D) $\dfrac{2}{\sqrt{3}}$ E) $\sqrt{2}$

12. $0 \le \alpha \le 90°$

$$\frac{\sqrt{2} \cdot \sin 3° \cdot \cos 11° + \sqrt{2} \cdot \sin 11° \cdot \cos 3°}{4\cos 83° \cdot \cos 7°} = \sin\alpha$$

$\Rightarrow \alpha = ?$

A) 15° B) 30° C) 45° D) 60° E) 90°

13. $\cos\left(\dfrac{\pi}{2} + a\right) = K$

K aşağıdakilerden hangisine eşittir?

Which of the following is equal to K?

A) $\sin\left(\dfrac{\pi}{2} - a\right)$ B) $\cos(2\pi - a)$ C) $\cos(-a)$ D) $\cos a$ E) $\sin(-a)$

14. $\left.\begin{array}{l} a = \sin 7° \\ b = \sin 82° \\ c = \sin 105° \end{array}\right\} \Rightarrow ? < ? < ?$

A) $a < b < c$ B) $a < c < b$ C) $b < a < c$ D) $b < c < a$ E) $c < b < a$

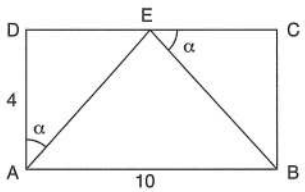
15. $\cos^2(x - y) + \sin^2(x + y) = ?$

A) $1 + \cos^2 x \cdot \sin^2 x$ B) $1 + \sin(2x) \cdot \cos(2x)$

C) $1 + \sin(2x) \cdot \sin(2y)$ D) $1 + \cos(2x) \cdot \cos(2y)$

E) $1 - \sin(2x) \cdot \sin(2y)$

16.



ABCD dikdörtgen

ABCD rectangle

$|AD| = 4$ br

$|AB| = 10$ br

$|EC| < |DE|$

$m(\widehat{DAE}) = m(\widehat{CEB}) = \alpha$

$\Rightarrow \cot\alpha = ?$

A) $\dfrac{1}{8}$ B) $\dfrac{1}{4}$ C) $\dfrac{1}{2}$ D) 2 E) 4

TRİGONOMETRİ
TRIGONOMETRY

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	D	D	D	D	E	B	A	D	D	D	B	A	B	E	E

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	A	B	A	C	B	D	E	D	B	E	C	A	A	D	B

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	B	B	A	C	C	B	E	D	E	C	C	A	D	D

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	E	B	D	C	D	B	A	D	C	C	E	A	A	A	A

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	C	D	C	B	E	C	B	E	D	D	C	E	A	B

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	E	A	D	E	B	C	D	E	E	D	A	D	E	E

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	E	A	A	E	A	C	A	A	E	D	E	E	D	C	D

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	A	E	D	E	C	C	B	D	D	A	D	C	D	B

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	C	A	B	E	D	A	E	C	E	C	D	A	C	C

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	C	E	C	A	E	A	E	C	E	D	C	D	A	D	E

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	D	B	C	B	D	C	C	A	A	B	D	A	A	E

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	C	B	E	A	A	A	B	D	E	D	C	D	A	B	C

TEST 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	B	E	E	C	A	B	D	C	A	E	D	E	C	E

TEST 14

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	B	C	C	C	D	D	C	E	D	A	D	A	C	E	A

TEST 15

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	C	B	C	E	E	D	E	C	D	B	E	C	B	C

TEST 16

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	D	B	C	A	B	C	A	A	D	E	E	E	E	A

TEST 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	E	E	E	A	A	E	C	E	B	A	A	B	D	E	B

TEST 18

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	E	B	C	E	C	B	C	E	A	A	C	D	A	A

TEST 19

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	A	B	D	E	D	D	C	D	C	A	D	C	C	C	C

TEST 20

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	A	D	E	A	E	A	E	A	E	C	E	B	C	C

KARMAŞIK SAYILAR

COMPLEX NUMBERS

KARMAŞIK SAYILAR

ÖZELLİK | Property 1

$x^2 = a \qquad a \in R^-$

$x = \sqrt{a} \qquad x \notin R$

$\boxed{i^2 = -1 \qquad \sqrt{-1} = i}$

Not | Note

$\sqrt{a} \cdot \sqrt{b} = \sqrt{a \cdot b} \qquad a, b \in R^+$

$\sqrt{a} \cdot \sqrt{b} \neq \sqrt{a \cdot b} \qquad a, b \in R^-$

Örnek | Example

$\underset{2i}{\sqrt{-4}} \cdot \underset{i}{\sqrt{-1}} = 2i^2 = -2$

ÖZELLİK | Property 2

$a \neq 0 \qquad a, b, c \in R$

$ax^2 + bx + c = 0$

$\Delta = b^2 - 4ac$

- $\Delta > 0$ İki farklı reel kök vardır.
  There are two different real roots.
- $\Delta = 0$ Reel bir kök vardır.
  There is one real root.
- $\Delta < 0$ Reel kök yoktur. Kökler karmaşık sayıdır.
  There is no real root. Roots are complex number.

1. $\sqrt{-9} = ?$ — $\boxed{3i}$

2. $\sqrt{-4} = ?$ — $\boxed{2i}$

3. $\sqrt{-1} = ?$ — $\boxed{i}$

4. $\sqrt{-25} = ?$ — $\boxed{5i}$

5. $\sqrt{-32} = ?$ — $\boxed{4\sqrt{2}i}$

6. $\sqrt[3]{-8} = ?$ — $\boxed{-2}$

7. $\sqrt{-4} \cdot \sqrt{9} = ?$ — $\boxed{6i}$

8. $\sqrt{-4} \cdot \sqrt{-9} = ?$ — $\boxed{-6}$

9. $\sqrt{-25} \cdot \sqrt{-1} = ?$ — $\boxed{-5}$

10. $\sqrt{-3} \cdot \sqrt{-12} = ?$ — $\boxed{-6}$

1. $x \in C$
$x^2 + 36 = 0$
$\Rightarrow$ S.S. = ? — $\boxed{\{-6i, 6i\}}$

2. $x \in C$
$x^2 + 49 = 0$
$\Rightarrow$ S.S. = ? — $\boxed{\{-7i, 7i\}}$

3. $x \in C$
$x^2 - 2x + 5 = 0$
$\Rightarrow$ S.S. = ? — $\boxed{\{1 - 2i, 1 + 2i\}}$

4. $x \in C$
$x^2 - 6x + 10 = 0$
$\Rightarrow$ S.S. = ? — $\boxed{\{3 - i, 3 + i\}}$

5. $x \in C$
$x^2 - 4x + 5 = 0$
$\Rightarrow$ S.S. = ? — $\boxed{\{2 - i, 2 + i\}}$

6. $x \in C$
$x^2 - 8x + 17 = 0$
$\Rightarrow$ S.S. = ? — $\boxed{\{4 - i, 4 + i\}}$

7. $x \in C$
$x^2 - 4x + 8 = 0$
$\Rightarrow$ S.S. = ? — $\boxed{\{2 - 2i, 2 + 2i\}}$

ÖZELLİK | Property 3

$z \in C \quad a, b \in R \quad i^2 = -1$

$z = a + ib$

Reel kısım *(Real part)* — $Re(z) = a$

İmajiner kısım *(Imaginary part)* — $Im(z) = b$

1. $z = 2 - i$

$\Rightarrow Im(z) = ?$ **−1**

2. $z = 3 + 4i$

$\Rightarrow Re(z) = ?$ **3**

3. $z = 3i - 2$

$Re(z) = ?$ **−2**

4. $z = 6i$

$\Rightarrow Re(z) = ?$ **0**

5. $z = \sqrt{-25} + 9$

$\Rightarrow Im(z) = ?$ **5**

6. $z = \sqrt{36} - \sqrt{-25}$

$\Rightarrow Im(z) = ?$ **−5**

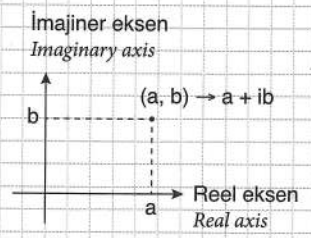
7. $z = 3 - 2i$

$\Rightarrow Im(z) \cdot Re(z) = ?$ **−6**

8. $z = 1 - 3i$

$\Rightarrow \dfrac{Im(z)}{Re(z)} = ?$ **−3**

ÖZELLİK | Property 4



İki Karmaşık Sayının Eşitliği

Equality of Two Complex Numbers

$a + ib = c + id \Longleftrightarrow a = c$ ve $b = d$

1. $x, y \in R$

$x + yi = 2 + 5i$

$\Rightarrow x + y = ?$ **7**

2. $x, y \in R$

$x + 4 + 2i = 6 - (y + 1)i$

$\Rightarrow x \cdot y = ?$ **−6**

3. $x, y \in R$

$3a - 6bi - 2 = 10 - 18i$

$\Rightarrow a \cdot b = ?$ **12**

4. $x, y \in R$

$2x + 3yi = 2y + 4 - 6i$

$\Rightarrow x = ?$ **0**

5. $x, y \in R$

$2x + 1 + 4yi = 5 + 8i$

$\Rightarrow x + y = ?$ **4**

6. $x, y \in R$

$x^2 - 4 + (y + 3)i = (6 + x)i$

$\Rightarrow \sum y = ?$ **6**

7. $x, y \in R$

$3x - y + 5i = 7 + (x + y)i$

$\Rightarrow x = ?$ **3**

8. $x, y \in R$

$2x + y + (x - 2y)i = 5$

$\Rightarrow x \cdot y = ?$ **2**

KARMAŞIK SAYILAR

ÖZELLİK | Property 5

Karmaşık Sayının Eşleniği

Complex Conjugate

$\overline{z}$, z'nin eşleniği *($\overline{z}$, conjugate of z)*

$z = a + ib \Rightarrow \overline{z} = a - ib$

1. $z = 6 - i$
$\Rightarrow \overline{z} = ?$ — $\boxed{6 + i}$

2. $z = -3 + 5i$
$\Rightarrow \overline{z} = ?$ — $\boxed{-3 - 5i}$

3. $z = 4$
$\Rightarrow \overline{z} = ?$ — $\boxed{4}$

4. $z = 5i$
$\Rightarrow \overline{z} = ?$ — $\boxed{-5i}$

5. $\overline{z} = 3 - 2i$
$\Rightarrow z = ?$ — $\boxed{3 + 2i}$

6. $\frac{z}{2} + 3i = 2$
$\Rightarrow \overline{z} = ?$ — $\boxed{4 + 6i}$

7. $\frac{\overline{z}}{3} - 2i = 1$
$\Rightarrow z = ?$ — $\boxed{3 - 6i}$

8. $z - 2 = 3i$
$\Rightarrow \overline{z} = ?$ — $\boxed{2 - 3i}$

ÖZELLİK | Property 6

Karmaşık Sayılarda Toplama ve Çıkarma

Addition and Subtraction of Complex Numbers

$z = a + ib$
$w = c + id$

$z + w = a + c + i(b + d)$
$z - w = a - c + i(b - d)$

1. $z_1 = 6 + 3i$
$z_2 = 4 - 2i$
$\Rightarrow z_1 + z_2 = ?$ — $\boxed{10 + i}$

2. $z_1 = 3 - 2i$
$z_2 = 6 + 5i$
$\Rightarrow z_1 - z_2 = ?$ — $\boxed{-3 - 7i}$

3. $z_1 = 2i$
$z_2 = 3 - 2i$
$\Rightarrow 3z_1 + z_2 = ?$ — $\boxed{3 + 4i}$

4. $z = 6 + i$
$\Rightarrow z + \overline{z} = ?$ — $\boxed{12}$

5. $z_1 = 3 - 2i$
$z_2 = 6 + 5i$
$\Rightarrow \overline{z}_1 + z_2 = ?$ — $\boxed{9 + 7i}$

6. $z_1 = 6 - 3i$
$z_2 = 7 + 2i$
$\Rightarrow \overline{z}_1 - 2\overline{z}_2 = ?$ — $\boxed{-8 + 7i}$

7. $z_1 = 3 - i$
$z_2 = 1 + i$
$\Rightarrow \overline{z}_1 + 2\overline{z}_2 = ?$ — $\boxed{5 - i}$

8. $z_1 = 3i$
$z_2 = 5$
$\Rightarrow 3\overline{z}_1 - 2\overline{z}_2 = ?$ — $\boxed{-10 - 9i}$

ÖZELLİK | Property 7

Karmaşık Sayılarda Çarpma

Multiplication of Complex Numbers

$$(a + ib)(c + id) = ac + adi + ibc + i^2bd$$
$$= ac - bd + i(bc + ad)$$

Not | Note

$$(a + ib)(a - ib) = a^2 + b^2$$

1. $(1 - i)(2 + i) = ?$ $\boxed{3 - i}$

2. $(3 + i)(2 - i) = ?$ $\boxed{7 - i}$

3. $(2 + 3i)(5 + 4i) = ?$ $\boxed{-2 + 23i}$

4. $(4 + 2i)(1 - i) = ?$ $\boxed{6 - 2i}$

5. $(1 - i)^2 = ?$ $\boxed{-2i}$

6. $(1 + i)^2 = ?$ $\boxed{2i}$

7. $(1 - i)^4 + (1 + i)^4 = ?$ $\boxed{-8}$

8. $(5 + i)(5 - i) = ?$ $\boxed{26}$

ÖZELLİK | Property 8

Karmaşık Sayılarda Bölme

Division of Complex Numbers

$$\frac{a + ib}{\underset{(c - id)}{c + id}} = \frac{(a + ib)(c - id)}{c^2 + d^2}$$

1. $z = 2 - i$
$\Rightarrow z \cdot \overline{z} = ?$ $\boxed{5}$

2. $\dfrac{4}{1 + i} = ?$ $\boxed{2 - 2i}$

3. $\dfrac{10}{1 - 2i} = ?$ $\boxed{2 + 4i}$

4. $\dfrac{6}{\sqrt{2} - i} = ?$ $\boxed{2\sqrt{2} + 2i}$

5. $\dfrac{4}{\sqrt{3} - i} = a + ib$
$\Rightarrow a \cdot b = ?$ $\boxed{\sqrt{3}}$

6. $z(1 - 2i) = 5$
$\Rightarrow z = ?$ $\boxed{1 + 2i}$

7. $z \cdot (3i) = 6$
$\Rightarrow z = ?$ $\boxed{-2i}$

8. $z = \dfrac{(2 - i)}{(1 + i)}$
$\Rightarrow \text{Im}(z) = ?$ $\boxed{-\dfrac{3}{2}}$

KARMAŞIK SAYILAR

ÖZELLİK | Property 9

Karmaşık sayı denklemlerinde z ve $\overline{z}$ varsa

if there are z and $\overline{z}$ in an equation of complex numbers by taking

$z = a + ib$

$\overline{z} = a - ib$

alınarak iki karmaşık sayının eşitliği kullanılır.

into account; equality of the two numbers is used

1. $z \cdot 2 + \overline{z} = 3 + i$

$\Rightarrow z = ?$ $\boxed{1 + i}$

2. $(2 - i)z + \overline{z} = 5 - 3i$

$\Rightarrow z = ?$ $\boxed{2 - i}$

3. $(1 + i)\overline{z} - 3 = z - i - 2$

$\Rightarrow z = ?$ $\boxed{1 + i}$

4. $3i \cdot z - \overline{z} = -6 + 2i$

$\Rightarrow \overline{z} = ?$ $\boxed{-2i}$

5. $z + 4 = 10 - \overline{z}$

$\Rightarrow Re(z) = ?$ $\boxed{3}$

6. $2z + \overline{z} = 6 + 3i$

$\Rightarrow z = ?$ $\boxed{2 + 3i}$

7. $(1 - i)\overline{z} = z + 1$

$\Rightarrow \overline{z} = ?$ $\boxed{2 + i}$

ÖZELLİK | Property 10

i'nin kuvvetleri | Exponents of "i"

$i^1 = i$

$i^2 = -1$

$i^3 = i^2 \cdot i = -i$

$i^4 = i^2 \cdot i^2 = 1$

i'nin 4'ten büyük kuvvetleri istenildiğinde, kuvveti 4 ile kalanlı bölme işlemi yapılır.

When the exponents of "i" greater than 4 are asked, long division is done.

Kalan *(Remainder)*;

$1 \Rightarrow i^1 = i$

$2 \Rightarrow i^2 = -1$

$3 \Rightarrow i^3 = -i$

$0 \Rightarrow i^0 = 1$

1. $\Rightarrow i^{25} = ?$ $\boxed{i}$

2. $\Rightarrow i^{-46} = ?$ $\boxed{-1}$

3. $i^{68} + i^{66} = ?$ $\boxed{0}$

4. $\dfrac{i^{45} - i^{46}}{i^{10}} = ?$ $\boxed{-i - 1}$

5. $a \in Z$

$i^{12a - 13} = ?$ $\boxed{-i}$

6. $i^1 + i^2 + i^3 + ... + i^{50} = ?$ $\boxed{i - 1}$

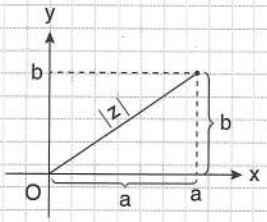
7. $i \cdot i^2 \cdot i^3 \cdot i^4 \cdot ..... \cdot i^{26} = ?$ $\boxed{-i}$

8. $i^1 - i^2 + i^3 - i^4 + i^5 + ... - i^{44} = ?$ $\boxed{0}$

ÖZELLİK | Property 11

Karmaşık Sayının Mutlak Değeri

Absolute Value of Complex Numbers



$z = a + ib$

$|z| = \sqrt{a^2 + b^2}$

Özellikler | Properties

- $|z| \geq 0$
- $|z| = |\bar{z}| = |-z| = |-\bar{z}|$
- $|z \cdot w| = |z| \cdot |w|$
- $\left|\dfrac{z}{w}\right| = \dfrac{|z|}{|w|}$ $\quad w \neq 0$
- $|z^n| = |z|^n$
- $|z + w| \leq |z| + |w|$

1. $z = 3 - 2i$

$\Rightarrow |z| = ?$

$\sqrt{13}$

2. $\bar{z} = 1 - 2i$

$\Rightarrow |z| = ?$

$\sqrt{5}$

3. $z = (1 - 2i)(1 + 3i)$

$\Rightarrow |z| = ?$

$5\sqrt{2}$

4. $z = \dfrac{(3 - 4i)}{(6 + 8i)}$

$\Rightarrow |z| = ?$

$\dfrac{1}{2}$

5. $z = \dfrac{(2 + 4i)(3 - 4i)}{(1 - i)}$

$\Rightarrow |z| = ?$

$5\sqrt{10}$

6. $\bar{z} = \dfrac{(1 - 2i)(3 - 2i)}{(2 + i)}$

$\Rightarrow |z| = ?$

$\sqrt{13}$

7. $z = \dfrac{(1 + 3i)(2 - i)}{(\sqrt{6} + 2i)}$

$\Rightarrow |z| = ?$

$\sqrt{5}$

8. $z = (1 + i)^{10}$

$\Rightarrow |z| = ?$

32

9. $z = \dfrac{(5 - 12i)(6 + 8i)}{(4 - 3i)}$

$\Rightarrow |z| = ?$

26

10. $|z| + z = 8 + 4i$

$\Rightarrow z = ?$

$3 + 4i$

ÖZELLİK | Property 12

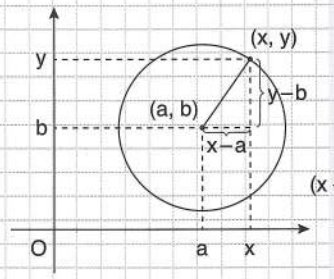
$z = x + iy$

$z_1 = a + ib \rightarrow$ sabit karmaşık sayı *(Constant complex number)*

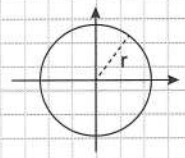
$$|z - z_1| = r$$
$$|x + iy - (a + ib)| = r$$
$$|(x - a) + i(y - b)| = r$$
$$\sqrt{(x-a)^2 + (y-b)^2} = r$$
$$(x-a)^2 + (y-b)^2 = r^2$$

$|z - z_1| = r$ z_1, merkezin koordinatlarını belirler.

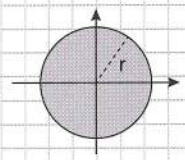
z_1, central coordinates are determined.



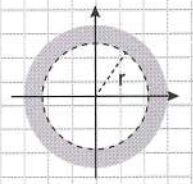
$(x - a)^2 + (y - b)^2 = r^2$



$|z| = r$

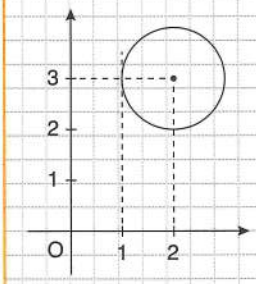


$|z| \leq r$



$|z| > r$

Örnek | Example



$|z - (2 + 3i)| = 1$

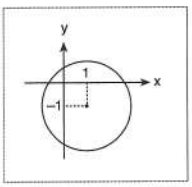
$M(2, 3)$

$r = 1$

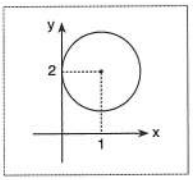
Aşağıda denklemi verilen karmaşık sayıların koordinat düzleminde gösterimi nedir?

What is the equation of the complex numbers shown on the coordinates plane?

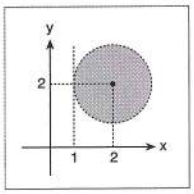
1. $|z - 1 + i| = 3$



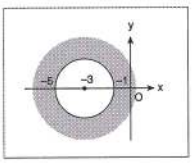
2. $|z - 1 - 2i| = 1$



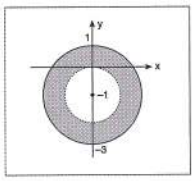
3. $|z - 2 - 2i| < 1$



4. $|z + 3| \geq 2$



5. $1 < |z + i| \leq 2$



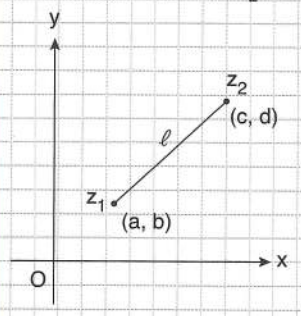
ÖZELLİK | Property 13

İki Karmaşık Sayı Arasındaki Uzaklık

Distance Between Two Complex Numbers

$z_1 = a + ib$

$z_2 = c + id$



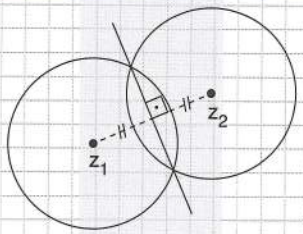
$\ell = |z_1 - z_2|$

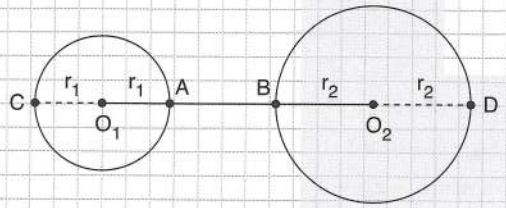
$\ell = \sqrt{(a-c)^2 + (b-d)^2}$

$|z - z_1| = |z - z_2|$

Çemberlerin kesim noktaları koordinat düzleminde doğru belirtir.

The points of intersection of circles will make a line on the coordinate plane.





İki çember arasındaki en kısa mesafe

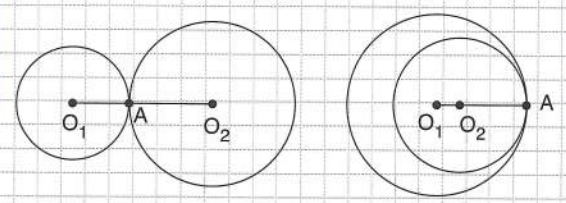
Shortest distance between two circles

$|AB| = |O_1O_2| - r_1 - r_2$

İki çember arasındaki en uzun mesafe

Longest distance between two circles

$|CD| = |O_1O_2| + r_1 + r_2$



O_1, O_2, A noktaları doğrusaldır.

O_1, O_2, A linear points.

$z = x + iy$ olmak üzere aşağıda verilen denklemlerdeki karmaşık sayıların koordinat düzleminde yer denklemini bulunuz.

If $z = x + iy$ then find the equation of the given complex numbers on the coordinate plane.

1. $|z - 1| = |z + i|$ — $x + y = 0$

2. $|z| = |z - 2i|$ — $y = 1$

3. $|z - 2| = |z + i|$ — $2y + 4x = 3$

4. $|z - 1 + i| = |z + 2i|$ — $y = -x - 1$

5. $|z - 1| \le |z|$ — $\frac{1}{2} \le x$

6. $|z + 1| > |z - i + 1|$ — $y > \frac{1}{2}$

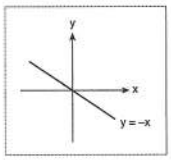
7. $|z - 2| > |z - 3i|$ — $6y > 4x + 5$

8. $|z + 1| < |z - i|$ — $x < -y$

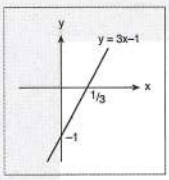
$z = x + iy$ olmak üzere aşağıda denklemi verilen karmaşık sayıların koordinat düzleminde gösterimi nedir?

If $z = x + iy$ then show the given complex number equation on the coordinate plane.

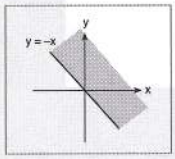
9. $|z + i| = |z - 1|$



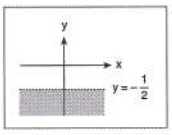
10. $|z - i + 1| = |z - 2|$



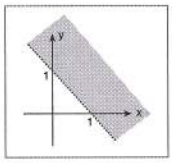
11. $|z - 2i| \leq |z + 2|$



12. $|z| > |z + i|$



13. $|z - 2| < |z - 1 + i|$



14. $|z| \leq 3$

$|z - (5 + 12i)| = r$

$\Rightarrow \max(r) = ?$

16

15. $|z| \leq 3$

$|z - (5 + 12i)| = r$

$\Rightarrow \min(r) = ?$

10

16. $|z_1 - (4 + 3i)| = 2$

$|z_2 - (1 - i)| = 1$

$\Rightarrow \min|z_1 - z_2| = ?$

2

17. $|z_1 - (4 + 3i)| = 2$

$|z_2 - (1 - i)| = 1$

$\Rightarrow \max|z_1 - z_2| = ?$

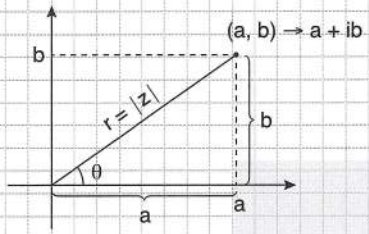
8

ÖZELLİK | Property 14

Kutupsal Gösterim

Polar Presentation

$z = a + ib \rightarrow$ standart yazılım *(standard format)*



$$\tan\theta = \frac{b}{a}$$

$$r = |z| = \sqrt{a^2 + b^2}$$

Argüment *(Argument)*

$$\text{Arg}(z) = \theta$$

$$\cos\theta = \frac{a}{r} \rightarrow a = r \cdot \cos\theta$$

$$\sin\theta = \frac{b}{r} \rightarrow b = r \cdot \sin\theta$$

$$z = a + ib$$

$$z = r\cos\theta + i \cdot r \cdot \sin\theta$$

$$z = \underbrace{r(\cos\theta + i\sin\theta)}_{\text{kutupsal gösterim}}$$

polar presentation

$$z = r \cdot \text{cis}\theta$$

Aşağıda verilen karmaşık sayıları kutupsal biçimde yazınız.

Write down the given complex numbers below in polar format.

1. $z = 1 + i$ — $\sqrt{2}\,\text{cis}\frac{\pi}{4}$

2. $z = 1 - \sqrt{3}i$ — $2\text{cis}\frac{5\pi}{3}$

3. $z = -\frac{\sqrt{3}}{2} - \frac{i}{2}$ — $\text{cis}\frac{7\pi}{6}$

4. $z = -\sqrt{3} + i$ — $2\text{cis}\frac{5\pi}{6}$

5. $z = -4 - 4i$ — $4\sqrt{2}\,\text{cis}\frac{5\pi}{4}$

6. $z = 5$ — $5\text{cis}0$

7. $z = 2i$ — $2\text{cis}\frac{\pi}{2}$

8. $z = -4i$ — $4\text{cis}\frac{3\pi}{2}$

9. $z = -3$ — $3\text{cis}\pi$

10. $z = \sqrt{3} - i$ — $2\text{cis}\frac{11\pi}{6}$

11. $z = 2 - 2i$ — $2\sqrt{2}\,\text{cis}\frac{7\pi}{4}$

12. $z = -3 - \sqrt{3}i$ — $2\sqrt{3}\,\text{cis}\frac{7\pi}{6}$

ÖZELLİK | Property 15

$z = r \cdot \text{cis}\theta$

$w = k \cdot \text{cis}\beta$

- $z \cdot w = r \cdot k \cdot \text{cis}(\theta + \beta)$
- $\dfrac{z}{w} = \dfrac{r}{k}\text{cis}(\theta - \beta)$
- $z^n = r^n \cdot \text{cis}(n \cdot \theta) \rightarrow$ De'moivre kuralı *(De'moivre's rule)*
- $\sqrt[n]{z} = \sqrt[n]{r} \cdot \text{cis}\left(\dfrac{\theta}{n}\right) \rightarrow$ n Farklı kök bulunması gerekir. *n different roots should be found.*

$\sqrt[n]{z} = \sqrt[n]{r} \cdot \text{cis}\left(\dfrac{\theta + 2k\pi}{n}\right) \quad k \in \{0, 1, 2, \ldots, (n-1)\}$

1. $z_1 = 2\text{cis}40°$

$z_2 = 3\text{cis}20$

$\Rightarrow z_1 \cdot z_2 = ?$

$\boxed{6\text{cis}60°}$

2. $z_1 = 4\text{cis}\left(\dfrac{\pi}{4}\right)$

$z_2 = 2\text{cis}\left(\dfrac{\pi}{6}\right)$

$\Rightarrow \text{Arg}\left(\dfrac{z_1}{z_2}\right) = ?$

$\boxed{\dfrac{\pi}{12}}$

3. $z_1 = 8(\cos75° + i \cdot \sin75°)$

$z_2 = 2(\cos15° + i \cdot \sin15°)$

$\Rightarrow \dfrac{z_1}{z_2} = ?$

$\boxed{2 + 2\sqrt{3}i}$

4. $z = 3\text{cis}20°$

$\Rightarrow z^3 = ?$

$\boxed{27\text{cis}60°}$

5. $z_1 = 2\text{cis}20°$

$z_2 = 3\text{cis}10°$

$\Rightarrow z_1^2 \cdot z_2 = ?$

$\boxed{12\text{cis}50°}$

6. $z_1 = 2\text{cis}5°$

$z_2 = \text{cis}10$

$\Rightarrow z_1^3 \cdot z_2^3 = ?$

$\boxed{4\sqrt{2} + 4\sqrt{2}i}$

7. $z = 3(\cos15° + i \cdot \sin15°)$

$\Rightarrow z^{10} = ?$

$\boxed{3^{10}\left(\dfrac{-\sqrt{3}}{2} + \dfrac{i}{2}\right)}$

8. $z = 2(\cos 10° + i\sin 10°)$
$\Rightarrow z^{18} = ?$

-2^{18}

9. $z = 4\text{cis}300°$
$\Rightarrow \sqrt{z} = ?$

$\{-\sqrt{3}+i\ ,\ \sqrt{3}-i\}$

10. $z = 4i$
$\Rightarrow \sqrt{z} = ?$

$\{\sqrt{2}+\sqrt{2}i\ ,\ -\sqrt{2}-\sqrt{2}i\}$

11. $z = 2\sqrt{3} - 2i$
$\Rightarrow \sqrt{z} = ?$

{2cis165°, 2cis345°}

12. $z = 27\text{cis}120°$
$\Rightarrow \sqrt[3]{z} = ?$

{3cis40°, 3cis160°, 3cis280°}

13. $z = 4\sqrt{3} + 4i$
$\Rightarrow \sqrt[3]{z} = ?$

{2cis10°, 2cis130°, 2cis250°}

14. $z = \cos 60° - i \cdot \sin 60°$
$\Rightarrow \sqrt[3]{z} = ?$

{cis100, cis220, cis340°}

15. $z = \cos 40° + i \cdot \sin 40°$
$\Rightarrow \sqrt[4]{z} = ?$

{cis10°, cis100°, cis190°, cis280°}

1. $z = 3 - i$
$\Rightarrow Im(z) = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

2. $z = 2 + 3i$
$\Rightarrow Re(z) = ?$

A) 5 B) 3 C) 2 D) –2 E) –5

3. $z = -6 + 11i$
$\Rightarrow Re(z) + Im(z) = ?$

A) – 5 B) – 4 C) – 1 D) 0 E) 5

4. $z = 6i$
$\Rightarrow Re(z) + Im(z) = ?$

A) – 3 B) 0 C) 3 D) 6 E) 9

5. $z_1 = 4 + 3i$
$z_2 = 1 - i$
$\Rightarrow Im(z_1) \cdot Re(z_2) = ?$

A) – 8 B) – 4 C) 3 D) 6 E) 12

6. $\sqrt{-1} = i$
$\Rightarrow \sqrt{-9} = ?$

A) – i B) – 2 C) i D) 2i E) 3i

7. $z = \sqrt{-16} + \sqrt{9}$
$\Rightarrow Re(z) + Im(z) = ?$

A) –7 B) – 4 C) –1 D) 1 E) 7

8. $z = \sqrt{36} - \sqrt{-25}$
$\Rightarrow Re(z) + Im(z) = ?$

A) –3 B) –1 C) 1 D) 3 E) 11

9. $\dfrac{\sqrt{-5}\cdot\sqrt{5}}{i^2} = ?$

A) $-5i$ B) 0 C) $5i$ D) $10i$ E) $20i$

10. $\sqrt{8}\cdot\sqrt{-8}\,i = ?$

A) -8 B) -4 C) 0 D) 4 E) 8

11. $x \in C$

$x^2 + 25 = 0$

$\Rightarrow$ S.S. = ?

A) $\{5i\}$ B) $\{-5i\}$ C) $\varnothing$ D) $\{-5i, 5i\}$ E) $\{-25i\}$

12. $x \in C$

$x^4 - 16 = 0$

$\Rightarrow$ S.S. = ?

A) $\{-2i, 2i\}$ B) $\{-4, 4\}$ C) $\{-2, 2\}$ D) $\{-4i, 4i\}$ E) $\{-2i, -2, 2, 2i\}$

13. $x \in C$

$x^4 + 11x^2 = 0$

$\Rightarrow$ S.S. = ?

A) $\{-\sqrt{11}, \sqrt{11}\}$ B) $\{\sqrt{11}i, -\sqrt{11}i\}$ C) 0 D) $\{\sqrt{11}i, 0, -\sqrt{11}i\}$ E) $\varnothing$

14. $x \in C$

$x^2 - 2x + 10 = 0$

$\Rightarrow$ S.S. = ?

A) $\{5 + i\}$ B) $\{1 - 5i\}$ C) $\{1 \pm 3i\}$ D) $\{1 + i\}$ E) $\{1 \pm i\}$

15. $x \in C$

$x^2 - 4x + 13 = 0$

$\Rightarrow$ S.S. = ?

A) $\{2 \pm i\}$ B) $\{3 \pm i\}$ C) $\{2 \pm 3i\}$ D) $\{2 + i\}$ E) $\{1 \pm i\}$

16. $x \in C$

$x^2 - 10x + 26 = 0$

$\Rightarrow$ S.S. = ?

A) $\{1 \pm 2i\}$ B) $\{3 \pm i\}$ C) $\{\sqrt{2} \pm i\}$ D) $\{5 \pm i\}$ E) $\{-2 \pm \sqrt{2}\,i\}$

1. $x, y \in R$
$x + yi = 3 - 6i$
$\Rightarrow x + y = ?$

A) –5 B) –3 C) 2 D) 5 E) 7

2. $x, y \in R$
$x + yi = 4$
$\Rightarrow x \cdot y = ?$

A) 0 B) 1 C) 2 D) 4 E) 8

3. $x, y \in R$
$x + 2i = 3 + (y - 3)i$
$\Rightarrow x \cdot y = ?$

A) –5 B) –1 C) 5 D) 10 E) 15

4. $x, y \in R$
$(x - 4) + (y - 1)i = -2$
$\Rightarrow x - 2y = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

5. $a, b \in R$
$3a - 7bi - 6 = 6 - 14i$
$\Rightarrow a \cdot b = ?$

A) –8i B) –8 C) –2 D) 4 E) 8

6. $x, y \in R$
$3x - 4yi = 2x - 1 + (y - 5)i$
$\Rightarrow x + y = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

7. $x, y \in R$
$y^2 - 16 + xyi = 8i$
$\Rightarrow \sum x = ?$

A) – 8 B) – 4 C) 0 D) 4 E) 8

8. $x, y \in R$
$3x + 2yi = 2y + (2x + 4)i$
$\Rightarrow x \cdot y = ?$

A) –24 B) –10 C) 5 D) 10 E) 24

9. $x, y \in R$

$3x - y - 6i = 2 + xi - 2yi$

$\Rightarrow x + y = ?$

A) -3 B) 0 C) 3 D) 5 E) 6

10. $z = 3 + 2i$

$\Rightarrow \bar{z} = ?$

A) $2 - 3i$ B) $2 + 3i$ C) $3 - 2i$ D) $-3 - 2i$ E) $-3 + 2i$

11. $z = 3i + 2$

$\Rightarrow \bar{z} = ?$

A) $3 + 2i$ B) $2 - 3i$ C) $-2 + 3i$ D) $-2 - 3i$ E) $3 - 2i$

12. $z = -4 + 2i$

$\Rightarrow \bar{z} = ?$

A) $-4 - 2i$ B) $2i - 4$ C) $2i + 4$ D) $2 - 4i$ E) $4i - 2$

13. $z = 6i$

$\Rightarrow \bar{z} = ?$

A) 6 B) $6i$ C) -6 D) $-6i$ E) 0

14. $z = 4$

$\Rightarrow \bar{z} = ?$

A) 4 B) $4i$ C) 0 D) -4 E) $-4i$

15. $\frac{z}{3} - 4i = 1$

$\Rightarrow \bar{z} = ?$

A) $3 - 2i$ B) $3 + 12i$ C) $3 - 12i$ D) $3 + 2i$ E) $1 - 4i$

16. $x, y \in R$

$z = x + iy$

$2x + y - yi = y - 2 + xi$

$\Rightarrow \bar{z} = ?$

A) $-1 + i$ B) -1 C) $1 - i$ D) $-2 + i$ E) $-1 - i$

1. $z_1 = 6 - 5i$
$z_2 = -3 + 4i$
$\Rightarrow z_1 + z_2 = ?$

A) $3 - i$ B) $3 - 2i$ C) $3 + i$ D) $-3 - i$ E) $7 - i$

2. $z_1 = 2 + 3i$
$z_2 = -3 + 2i$
$\Rightarrow z_1 - z_2 = ?$

A) $-7 - i$ B) $-1 + i$ C) $-1 + 7i$ D) $5 - i$ E) $5 + i$

3. $z_1 = 1 - 2i$
$z_2 = 2 - 3i$
$\Rightarrow z_1 + 2 \cdot z_2 = ?$

A) $-1 - 2i$ B) $9 + 6i$ C) $5i$ D) $5 - 8i$ E) $3 - 5i$

4. $z = 4 + i$
$\Rightarrow z - \bar{z} = ?$

A) $6 - 4i$ B) $8 - 2i$ C) 8 D) $8 + 2i$ E) $2i$

5. $(3 - i) \cdot (3 + i) = ?$

A) 10 B) $4i$ C) $6 + 2i$ D) $6 - 2i$ E) $4 + 7i$

6. $(2 - i) \cdot (1 + 2i) = ?$

A) $2 - 4i$ B) $4 - 3i$ C) $3 + 4i$ D) $4 + 3i$ E) $-4 + 3i$

7. $(3 - 5i)^2 + (5 + 3i)^2 = ?$

A) 34 B) 17 C) 9 D) 4 E) 0

8. $(1 - i)^5 + (1 + i)^5 = ?$

A) $-8i - 8$ B) $4i - 4$ C) 2 D) $8i$ E) -8

9. $(2-2i)^2 + (2+2i)^2 = ?$

A) $-8i$ B) $-4i$ C) 0 D) $4i$ E) $8i$

10. $z = (3-i)^2$
$\Rightarrow z \cdot \bar{z} = ?$

A) 1 B) $\sqrt{10}$ C) 10 D) 50 E) 100

11. $z = (1-2i)^2$
$\Rightarrow \bar{z} \cdot z = ?$

A) $\sqrt{5}$ B) 5 C) 10 D) 20 E) 25

12. $z = (2-i) \cdot (1+i)$
$\Rightarrow z + \bar{z} = ?$

A) -6 B) $-3i$ C) 0 D) $3i$ E) 6

13. $z = 4 + 3i$
$\Rightarrow z + \bar{z} + z \cdot \bar{z} = ?$

A) -19 B) $16-3i$ C) $6-25i$ D) $16+3i$ E) 33

14. $z = (1-i)^2 + (1+i)^4$
$\Rightarrow \mathrm{Re}(\bar{z} \cdot z + z) = ?$

A) -10 B) 12 C) 16 D) 20 E) 24

15. $z = 2 - \sqrt{2}i$
$\Rightarrow z \cdot \bar{z} + z - \bar{z} = ?$

A) $3+2\sqrt{2}i$ B) $6+2\sqrt{2}i$ C) 10 D) 6 E) $6-2\sqrt{2}i$

16. $z = 4 + i$
$\Rightarrow 3z + i(1-\bar{z}) = ?$

A) -11 B) -10 C) 0 D) 10 E) 11

1. $\frac{2+2i}{2-2i}+\frac{2-2i}{2+2i}=?$

A) $1-i$ B) $1+i$ C) $4i$ D) $-4i$ E) 0

2. $\frac{4}{1-i}+\frac{5}{1+2i}=?$

A) 3 B) $3-i$ C) $2+i$ D) $1-i$ E) $2-i$

3. $\frac{4}{\sqrt{3}+i}+\frac{4}{\sqrt{3}-i}=?$

A) $-2\sqrt{3}$ B) $-2i$ C) $2\sqrt{3}$ D) $2i$ E) $8\sqrt{3}$

4. $\text{Re}\left(\frac{i}{1+2i}\right)-\text{Im}\left(\frac{5}{1-2i}\right)=?$

A) $-\frac{8}{5}$ B) $\frac{12}{5}$ C) $\frac{3}{5}$ D) $\frac{4}{5}$ E) $-\frac{1}{5}$

5. $a, b \in R$

$\frac{a}{1+3i}+\frac{b}{i+3}=-2-6i$

$\Rightarrow b=?$

A) 25 B) 15 C) 0 D) -15 E) -25

6. $z_1=3-5i$

$z_2=4-2i$

$z_3=1+i$

$\Rightarrow \text{Re}\left(\frac{z_1-z_2}{(z_3)^2}\right)$

A) $\frac{1}{2}$ B) $\frac{3}{2}$ C) $\frac{1}{4}$ D) $-\frac{1}{2}$ E) $-\frac{3}{2}$

7. $z_1=1-2i$

$z_2=-3i$

$\Rightarrow \frac{z_1\cdot\bar{z}_2}{2+i}=?$

A) 6 B) 3 C) $-i$ D) $2-i$ E) $3i$

8. $\left(\frac{1-\sqrt{2}i}{1+\sqrt{2}i}\right)^2+\left(\frac{1+\sqrt{2}i}{1-\sqrt{2}i}\right)^2=?$

A) $-\frac{14}{9}$ B) $\sqrt{2}i$ C) $\frac{14}{9}$ D) $1-\sqrt{2}i$ E) $2+2\sqrt{2}i$

9. $i^2 = -1$

$\Rightarrow \dfrac{\sqrt{-6}\cdot\sqrt{-2}\cdot\sqrt{-8}}{\sqrt{-3}\cdot\sqrt{-4}} = ?$

A) $-4i$ B) $-\sqrt{2}i$ C) $\sqrt{2}$ D) 2 E) $2\sqrt{2}i$

10. $\dfrac{z\cdot(2+i)}{5} = 2-i$

$\Rightarrow z = ?$

A) $3-4i$ B) $2-i$ C) $3+4i$ D) $1-2i$ E) $\dfrac{3-4i}{5}$

11. $(z+2)\cdot(1-i) = 4+4i$

$\Rightarrow z = ?$

A) $4i$ B) $2i-1$ C) $1-2i$ D) $4-2i$ E) $4i-2$

12. $z + 3i = 2 - iz$

$\Rightarrow \text{Im}(z) = ?$

A) $\dfrac{3}{2}$ B) -1 C) $-\dfrac{1}{2}$ D) $-\dfrac{3}{2}$ E) $-\dfrac{5}{2}$

13. $(2+i)\cdot z = z+1$

$\Rightarrow \text{Re}(z) = ?$

A) $-\dfrac{1}{2}$ B) $-\dfrac{1}{3}$ C) $\dfrac{1}{5}$ D) $\dfrac{1}{2}$ E) $\dfrac{3}{5}$

14. $(1-i)\cdot\bar{z} = z+2i+1$

$\Rightarrow \text{Im}(z) = ?$

A) -2 B) -1 C) 1 D) 2 E) $\dfrac{5}{2}$

15. $(1-2i)\cdot\bar{z} - 4 = z$

$\Rightarrow z = ?$

A) $2-2i$ B) $2i$ C) $-2i$ D) $-3-3i$ E) $-3+i$

16. $\bar{z}\cdot(z+i+1) = 4$

$\Rightarrow$ z karmaşık sayılarından biri hangisidir?

Which one of the following is a root of complex number z?

A) $1+i$ B) $-2-i$ C) $1-i$ D) $-1-i$ E) $2-i$

1. $i^2 = -1$
$\Rightarrow i^{46} = ?$

A) i B) $2i$ C) 1 D) -1 E) $-i$

2. $i^2 = -1$
$\Rightarrow i^{-26} = ?$

A) -1 B) $-i$ C) 1 D) i E) $2i$

3. $i^2 = -1$
$\Rightarrow i^{80} + i^{82} = ?$

A) $1 - i$ B) $1 + i$ C) 1 D) $-2i$ E) 0

4. $i^2 = -1$
$\Rightarrow \frac{i^{85}}{i^{45}} = ?$

A) $-i$ B) -1 C) i D) 1 E) 0

5. $i^2 = -1$
$\Rightarrow i^8 - i^{12} + i^{20} - i^{36} = ?$

A) i B) 0 C) 1 D) -1 E) $-i$

6. $i^2 = -1$
$\Rightarrow \frac{i^{166} + i^{347}}{i^{411} + i^{142}} = ?$

A) -1 B) 0 C) 1 D) $2i$ E) $-i$

7. $i^2 = -1$
$\Rightarrow \frac{i^{-32} + i^{-41}}{i^{-28} - i^{-35}} = ?$

A) -1 B) $-2i$ C) i D) $2i$ E) 1

8. $P(x) = (x + i)^{12}$
$\Rightarrow P(i) = ?$

A) -2^{16} B) -2^6 C) 2^6 D) 2^{12} E) $2^{12}i$

9. $P(x) = x^{22} - 3x^{14} + x^{11} + x - 1$
$\Rightarrow P(i) = ?$

A) -1 B) $1 + i$ C) 1 D) $2 + i$ E) $3 + i$

10. $P(x) = x^{10} + x^{6} + x^{2} + 3$
$\Rightarrow P(i) = ?$

A) $-82i$ B) $-i$ C) 0 D) i E) $2i$

11. $n \in N$
$\Rightarrow i^{12n+11} + i^{20n-1} = ?$

A) $-2i$ B) $-i$ C) 0 D) $2i$ E) 2

12. $n \in N$
$\Rightarrow i^{4n+5} + i^{8n+3} + i^{12n+12} + i^{8n+6} = ?$

A) $2i$ B) i C) 0 D) $-i$ E) -1

13. $i^2 = -1$
$\Rightarrow (1 - i) \cdot (1 + i^9) \cdot (1 + i^{15}) \cdot (1 + i^{13}) = ?$

A) 6 B) 4 C) $2i$ D) 0 E) $-4i$

14. $i^2 = -1$
$\Rightarrow i + i^2 + i^3 + \ldots\ldots + i^{69} = ?$

A) $-64i$ B) $-32i$ C) i D) $32i$ E) 64

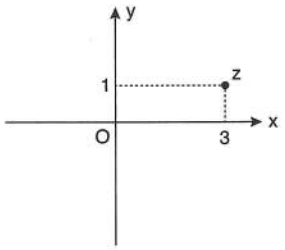
15. $i^2 = -1$
$\Rightarrow 1 - i + i^2 - i^3 + i^4 \ldots\ldots + i^{66} - i^{67} = ?$

A) $-66i$ B) 0 C) $-1 + i$ D) $1 + i$ E) $67i$

16. $i^2 = -1$
$\Rightarrow (1 - i)^6 = ?$

A) $-8i$ B) -8 C) $2i$ D) 8 E) $8i$

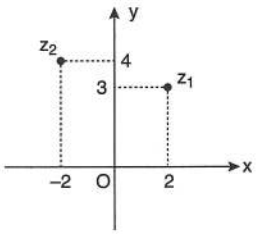
1.



$\Rightarrow |z| = ?$

A) $\sqrt{5}$ B) $\sqrt{7}$ C) 3 D) $\sqrt{10}$ E) $2\sqrt{3}$

2.



$\Rightarrow |z_1| + |z_2| = ?$

A) $2\sqrt{5}$ B) $-2\sqrt{5}+5$ C) $2\sqrt{5}+\sqrt{13}$ D) $\sqrt{13}-2\sqrt{5}$ E) $\sqrt{5}+\sqrt{13}$

3. $z = 3 - 4i \Rightarrow |z| = ?$

A) 3 B) 4 C) 5 D) 6 E) 10

4. $z = (1 + 2i) \cdot (1 - 3i)$
$\Rightarrow |z| = ?$

A) 3 B) 4 C) 5 D) 8 E) $5\sqrt{2}$

5. $z = 3 - 6i$
$\Rightarrow |z \cdot \bar{z}| = ?$

A) 5 B) 9 C) 18 D) 25 E) 45

6. $z_1 = \sqrt{3} + i$
$z_2 = 2\sqrt{3} - 2i$
$\Rightarrow |z_1 \cdot z_2| = ?$

A) 2 B) $2\sqrt{3}$ C) 3 D) 4 E) 8

7. $z = 3 - i$

$\Rightarrow |z^{-1}| = ?$

A) $\sqrt{5}$ B) $\sqrt{10}$ C) $\frac{\sqrt{5}}{2}$ D) $\frac{\sqrt{5}}{5}$ E) $\frac{\sqrt{10}}{10}$

8. $z = (1 + \sqrt{3}i) \cdot (\sqrt{2} - \sqrt{2}i)$
$\Rightarrow |z^{-1}| = ?$

A) $\frac{1}{8}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{1}{4}$ D) $\frac{\sqrt{2}}{4}$ E) 4

9. $z = \frac{4+2i}{1-3i}$

$\Rightarrow |z| = ?$

A) $\frac{\sqrt{5}}{5}$ B) $\sqrt{2}$ C) $\sqrt{5}$ D) $\frac{3\sqrt{5}}{5}$ E) $\frac{3\sqrt{5}}{10}$

10. $z = \frac{\sqrt{2}+i}{4-\sqrt{5}i}$

$\Rightarrow |z^2| = ?$

A) $\frac{1}{7}$ B) $\frac{2}{3}$ C) $\sqrt{10}$ D) $\frac{1}{3}$ E) 2

11. $z = \frac{2+i}{3-4i}$

$\Rightarrow |z^{-2}| = ?$

A) $5\sqrt{5}$ B) $4\sqrt{5}$ C) 5 D) $2\sqrt{5}$ E) $\sqrt{5}$

12. $|z| = 4$

$\Rightarrow \left|\frac{|z|\cdot\bar{z}}{z}\right| = ?$

A) 1 B) 4 C) 8 D) 16 E) 64

13. $z = a + (b-1)i$

$\Rightarrow |\bar{z}| - |-z| = ?$

A) $a^2 + b^2$ B) 2a C) 2ai D) $\sqrt{2}$ E) 0

14. $z = \frac{(5-2i)\cdot(12+5i)}{2+5i}$

$\Rightarrow |z| = ?$

A) 13 B) $13\sqrt{2}$ C) 12 D) 9 E) $\sqrt{13}$

15. $z = \frac{(2+4i)\cdot(9-12i)}{3+6i}$

$\Rightarrow |z| = ?$

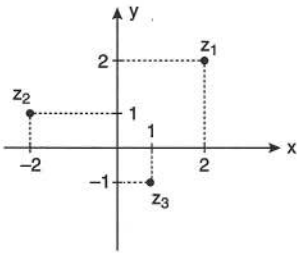
A) 5 B) 10 C) 15 D) $\sqrt{11}$ E) $\sqrt{22}$

16. $\bar{z} = \frac{(2-3i)\cdot(4+6i)}{5-12i}$

$\Rightarrow |z| = ?$

A) 1 B) 2 C) $\sqrt{13}$ D) 13 E) 26

1.



$\Rightarrow \left|\dfrac{z_1 \cdot z_2}{z_3}\right| = ?$

A) $\sqrt{5}$ B) $2\sqrt{5}$ C) 5 D) $\dfrac{5\sqrt{2}}{2}$ E) 10

2. $z = \dfrac{1+i}{1-i} + \dfrac{1-i}{1+i}$

$\Rightarrow |z| = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

3. $z_1 = 4 - 3i$

$z_2 = \dfrac{\sqrt{3}}{2} + \dfrac{1}{2}i$

$\Rightarrow \left|(z_1)^2 \cdot (z_2)^2\right| = ?$

A) 125 B) 100 C) 75 D) 50 E) 25

4. $z = \dfrac{(1+3i)^3 \cdot (1-3i)^7}{(3-i)^6}$

$\Rightarrow |z| = ?$

A) 100 B) 10 C) $\sqrt{10}$ D) 5 E) $\sqrt{5}$

5. $|z| - 2 + 4i = z$

$\Rightarrow \text{Re}(z) = ?$

A) – 4 B) –3 C) $\dfrac{1}{2}$ D) $\dfrac{3}{4}$ E) 3

6. $|z| + z = 16 + 8i$

$\Rightarrow z = ?$

A) 6 + 8i B) 6 – 8i C) – 6 + 8i D) 8 – 6i E) – 8 – 6i

7. $|z - 4i| + z = 18 + 16i$

$\Rightarrow \text{Re}(z) = ?$

A) –16 B) –12 C) –5 D) 5 E) 16

8. $z + 2 + |z + 6i| = 13 + 5i$

$\Rightarrow z = ?$

A) 5i B) 1 – 3i C) –5i D) 3i E) 3 + i

9. $z = a + bi, \quad a > 0$
$z^2 + |z| = 12$
$\Rightarrow Re(z) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

10. $z = a + bi, \quad a > 0$
$|z + \bar{z}| + z - 24 = 2i$
$\Rightarrow Re(z) \cdot Im(z) = ?$

A) -18 B) -16 C) 3 D) 8 E) 16

11. $z = x + yi$
$|z - 2i| = |z - 1|$
$y = ax + b$
$\Rightarrow y = ?$

A) $y = x$ B) $y = 2x$ C) $y = -x$ D) $4y = 2x - 3$ E) $4y = 2x + 3$

12. $z = x + yi$
$|z - 1| = |z + i|$
$y = ax + b$
$\Rightarrow y = ?$

A) $y = x - 2$ B) $y = 2x$ C) $y = -x - 1$ D) $y = x$ E) $y = -x$

13. $z = x + yi$
$|z - i + 2| = |z + 1|$
$y = ax + b$
$\Rightarrow y = ?$

A) $y = 2x$ B) $y = x$ C) $y = x + 2$ D) $y = -2x$ E) $y = -x + 2$

14. $z = x + yi$
$|z + 1| > |z + i|$
$\Rightarrow S.S. = ?$

A) $y > x + 1$ B) $y < x - 1$ C) $y > x$ D) $y < x$ E) $y > x - 2$

15. $z = x + yi$
$|z - 2i| \leq |z|$
$\Rightarrow S.S. = ?$

A) $y \geq 1$ B) $y \geq 4$ C) $y \geq -1$ D) $y \leq -1$ E) $y \geq -4$

16. $z = x + yi$
$|z| \geq |z + 1|$
$\Rightarrow S.S. = ?$

A) $x \geq y - 1$ B) $\frac{1}{2} > x$ C) $x \leq -\frac{1}{2}$ D) $\frac{1}{2} \geq x$ E) $2 - x \geq 0$

1. $z_1 = 4 - 2i$
$z_2 = 1 - 8i$
$\Rightarrow |z_1 - z_2| = ?$

A) 10 B) $3\sqrt{5}$ C) 6 D) 5 E) $2\sqrt{5}$

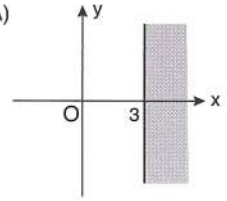
2. $z_1 = 8 - 4i$
$z_2 = 2 + 4i$
$\Rightarrow |z_1 - z_2| = ?$

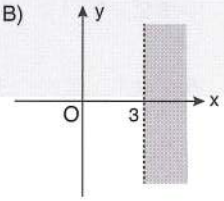
A) 10 B) 8 C) $5\sqrt{2}$ D) 6 E) 5

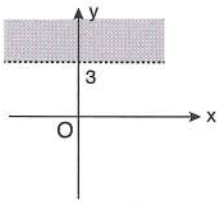
3. $A = \{z \mid Re(z) > 3,\ z \in C\}$

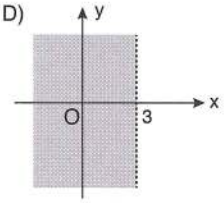
A kümesinin elemanlarının koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

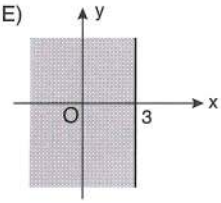
Which of the following is the graph of elements of a set on the coordinate plane?

A)


B)


C)


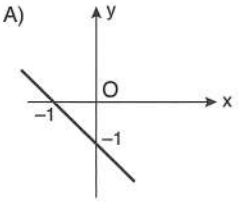
D)


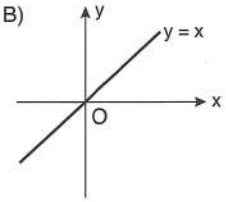
E)


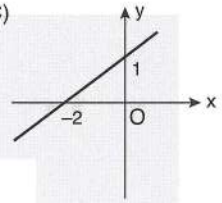
4. $|z - i| = |z - 1|$

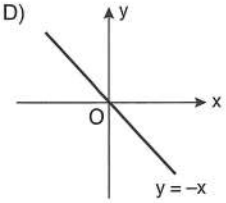
Denklemi verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

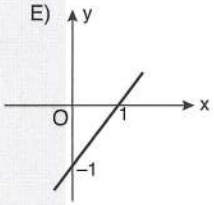
Which of the following is the graph on the coordinate plane of the given complex number $|z - i| = |z - 1|$?

A)


B)


C)


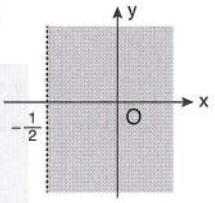
D)


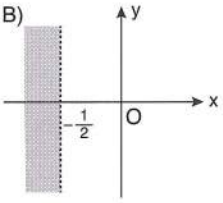
E)


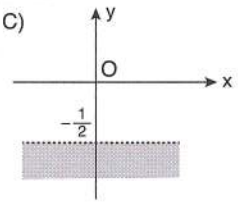
5. $|z - i| > |z|$

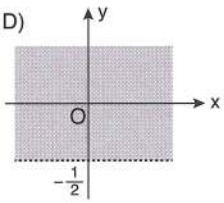
Eşitsizliği verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

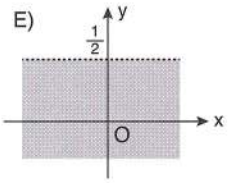
Which of the following is the graph on the coordinate plane of the given complex number inequality $Iz - iI > IzI$?

A)


B)


C)


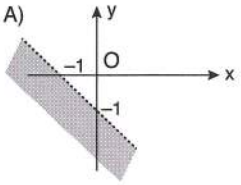
D)


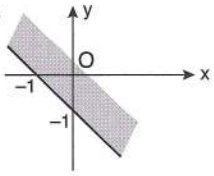
E)


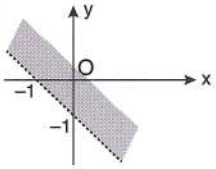
6. $|z-2i| < |z+1-i|$

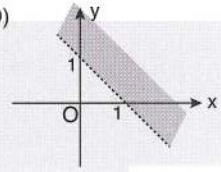
Eşitsizliği verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

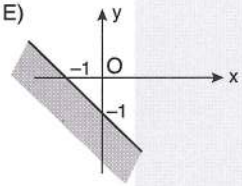
Which of the following is the graph on the coordinate plane of the given complex number inequality $|z-2i| < |z+1-i|$?

A)


B)


C)


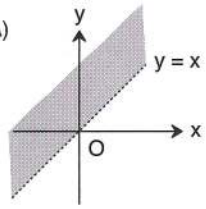
D)


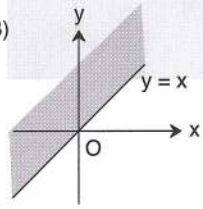
E)


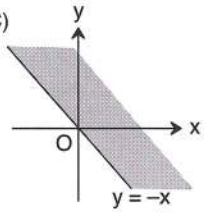
7. $|z+i| \geq |z-1|$

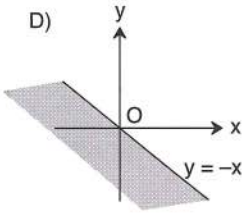
Eşitsizliği verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

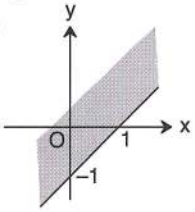
Which of the following is the graph on the coordiante plane of the given complex number inequality $|z+i| \geq |z-1|$?

A)


B)


C)


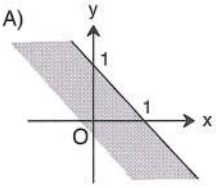
D)


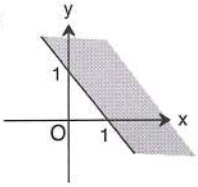
E)


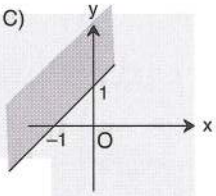
8. $|z+2| \leq |z+1+i|$

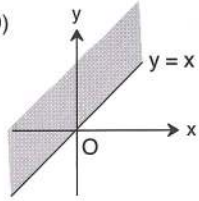
Eşitsizliği verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

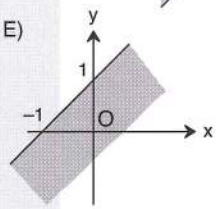
Which of the following is the graph on the coordinate plane of the given complex number inequality $|z+2| \leq |z+1+i|$?

A)


B)


C)


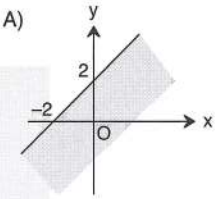
D)


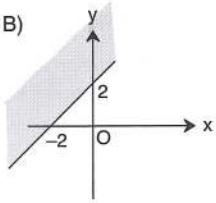
E)


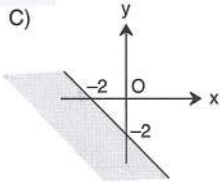
9. $|z-i+2| \geq |z+1|$

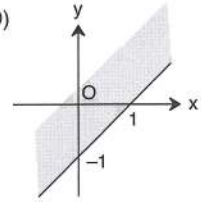
Eşitsizliği verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

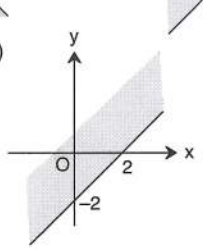
Which of the following is the graph on the coordiante plane of the given complex number inequality $|z-i+2| \geq |z+1|$?

A)


B)


C)


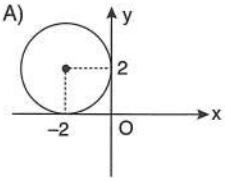
D)


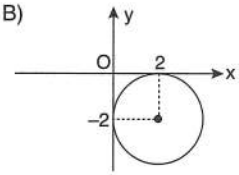
E)


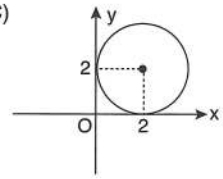
1. $|z - 2 + 2i| = 2$

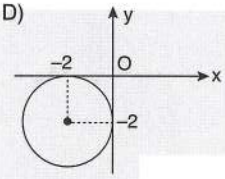
Denklemi verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

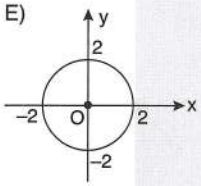
Which of the following is the graph on the coordinate plane of the given complex number equation $|z - 2 + 2i| = 2$?

A)


B)


C)


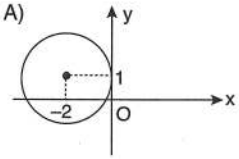
D)


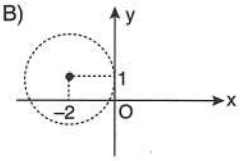
E)


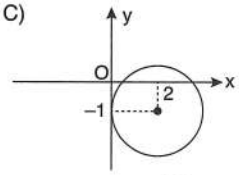
2. $|z - 2| = 2$

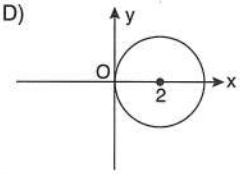
Denklemi verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

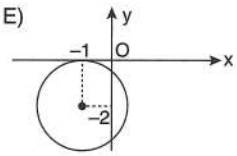
Which of the following is the graph on the coordinate plane of the given complex number equation $|z - 2| = 2$?

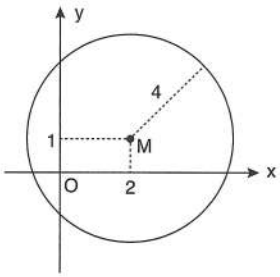
A)


B)


C)


D)


E)


3.


Şekilde verilen karmaşık sayılar aşağıda verilen denklemlerden hangisinin çözüm kümesidir?

Which of the following is a solution set of complex numbers shown on the figure?

A) $|z - 2 + i| = 4$

B) $|z + 2 - 2i| = 4$

C) $|z + 2 + i| = 4$

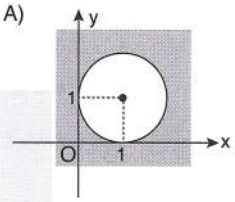
D) $|z - 2 - 2i| = 4$

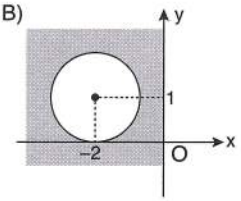
E) $|z - 2 - i| = 4$

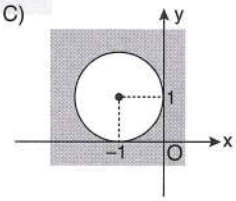
4. $|z + 2 - i| \geq 1$

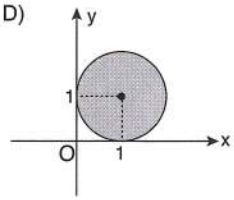
Eşitsizliği verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

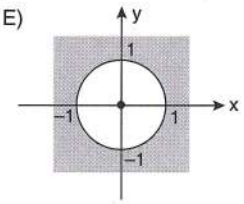
Which of the following is the graph on the coordinate plane of the given complex number inequality $|z + 2 - i| \geq 1$?

A)


B)


C)


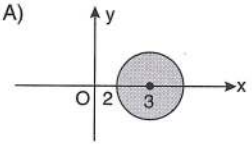
D)


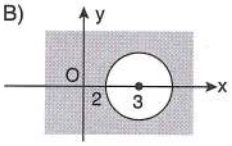
E)


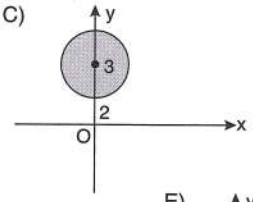
5. $|z-3| \le 1$

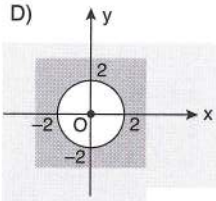
Eşitsizliği verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

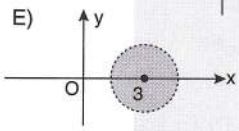
Which of the following is the graph on the coordinate plane of the given complex number inequality $|z-3| \le 1$?

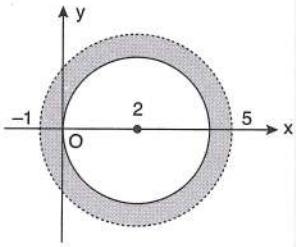
A)


B)


C)


D)


E)


6.


Şekildeki karmaşık sayılar aşağıdaki hangi denklem sisteminin çözüm kümesidir?

Which of the following is a solution set of complex numbers shown on the figure?

A) $|z-2| \ge 1$
B) $2 \le |z-2| < 3$
C) $1 \le |z-2| \le 3$
D) $|z-2| \ge 1,\ |z-2| \ge 3$
E) $4 \le |z-2| < 9$

7. $z \in C$

$|z-3+4i| = 8$

$\Rightarrow \max |z| = ?$

A) 3 B) 5 C) 7 D) 10 E) 13

8. $z = x + yi,\ |z| \le 6$

$\Rightarrow \min |z-8-6i| = ?$

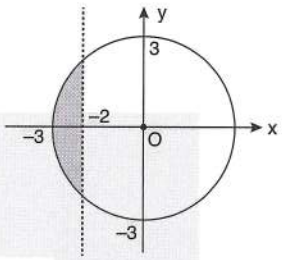
A) 4 B) 6 C) 8 D) 9 E) 10

9. $z \in C$

$|z| \le 8$

$\Rightarrow \max |z-5-12i| = ?$

A) 10 B) 15 C) 20 D) 21 E) 25

10.


Şekildeki karmaşık sayılar, hangi denklem sisteminin çözüm kümesidir?

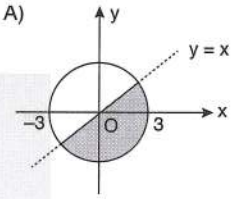
Which of the following is a solution set of complex numbers shown on the figure?

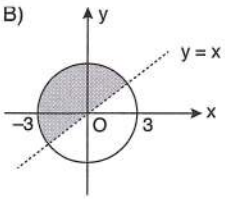
A) $|z| < 3,\ Re(z) < -2$
B) $|z| > 3,\ Re(z) < -2$
C) $|z| \le 3,\ Im(z) < -2$
D) $|z| \le 3,\ Re(z) \le -2$
E) $|z| \le 3,\ Re(z) < -2$

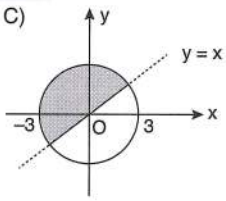
11. $\{z : |z+i| \ge |z+1|,\ |z| \le 3,\ z \in C\}$

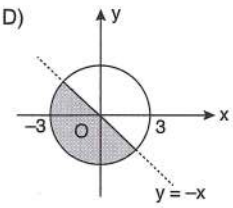
Kümesi verilen karmaşık sayıların koordinat düzlemindeki gösterimi aşağıdakilerden hangisidir?

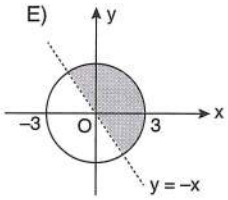
Which of the following is the graph of complex numbers on the coordinate plane which have set $\{z : |z+i| \ge |z+1|,\ |z| \le 3,\ z \in C\}$

A)


B)


C)


D)


E)


1. $z = 4 + 4i$
$\Rightarrow Arg(z) = ?$

A) $\frac{\pi}{6}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{3}$ D) $\frac{2\pi}{3}$ E) $\frac{3\pi}{4}$

2. $z = 1 + \sqrt{3}i$
$r = |z|$
$Arg(z) = \theta$
$\Rightarrow (r, \theta) = ?$

A) (2, 60°) B) (3, 30°) C) (4, 60°) D) (4, 120°) E) (16, 120°)

3. $z = 2 + 2\sqrt{3}i$
$z = r(\cos\theta + i\sin\theta)$
$\Rightarrow z = ?$

A) $4(\cos \pi/3 + i\sin \pi/3)$ B) $4(\cos \pi/6 + i\sin \pi/6)$
C) $4(\cos 2\pi/3 + i\sin 2\pi/3)$ D) $\sqrt{2}(\cos \pi/3 + i\sin \pi/3)$
E) $4(\cos 5\pi/6 + i\sin 5\pi/6)$

4. $z = 1 + i$
$z = r(\cos\theta + i\sin\theta)$
$\Rightarrow z = ?$

A) $(\cos \pi/6 + i\sin \pi/6)$ B) $(\cos \pi/3 + i\sin \pi/3)$
C) $\sqrt{2}(\cos 2\pi/3 + i\sin 2\pi/3)$ D) $\sqrt{2}(\cos \pi/4 + i\sin \pi/4)$
E) $(\cos \pi/4 + i\sin \pi/4)$

5. $z = -\sqrt{3} + i$
$z = r \cdot cis\theta$
$\Rightarrow z = ?$

A) $2cis\frac{\pi}{6}$ B) $4cis\frac{4\pi}{4}$ C) $4cis\frac{5\pi}{6}$ D) $4cis\frac{7\pi}{6}$ E) $2cis\frac{5\pi}{6}$

6. $z = -5i$
$z = r \cdot cis\theta$
$\Rightarrow z = ?$

A) $z = 5cis\frac{\pi}{2}$ B) $z = 5cis\pi$ C) $z = -5cis\frac{\pi}{2}$ D) $z = 5cis2\pi$ E) $z = 5cis\frac{3\pi}{2}$

7. $z = \frac{\sqrt{3}}{4} - \frac{1}{4} \cdot i$
$z = r \cdot cis\theta$
$\Rightarrow z = ?$

A) $\frac{1}{2}cis\frac{\pi}{6}$ B) $\frac{1}{2}cis\frac{11\pi}{6}$ C) $cis\frac{2\pi}{3}$ D) $2cis\frac{7\pi}{6}$ E) $\frac{1}{2}cis\frac{7\pi}{6}$

8. $z = -4 + 4i$
$z = r \cdot cis\theta$
$\Rightarrow z = ?$

A) $4\sqrt{2}cis\frac{5\pi}{4}$ B) $4\sqrt{2}cis\frac{3\pi}{4}$
C) $4\sqrt{2}cis\frac{2\pi}{3}$ D) $4\sqrt{2}cis\frac{4\pi}{3}$
E) $4cis\frac{7\pi}{4}$

9. $z = 3\sqrt{3} - 3i$

$z = r \cdot \text{cis}\theta$

$\Rightarrow z = ?$

A) 6cis210° B) 6cis225°
C) 6cis240° D) 3cis330°
E) 6cis330°

10. $z = \dfrac{2}{1-i}$

$z = r \cdot \text{cis}\theta$

$\Rightarrow z = ?$

A) $\text{cis}\dfrac{\pi}{2}$ B) $\text{cis}\dfrac{5\pi}{4}$ C) $\text{cis}\dfrac{\pi}{4}$
D) $2\text{cis}\dfrac{\pi}{4}$ E) $\sqrt{2}\,\text{cis}\dfrac{\pi}{4}$

11. $z = 2\left(\cos\dfrac{\pi}{4} - i\sin\dfrac{\pi}{4}\right)$

$z = r \cdot \text{cis}\theta$

$\Rightarrow z = ?$

A) $2\text{cis}\dfrac{7\pi}{4}$ B) $2\text{cis}\dfrac{5\pi}{4}$ C) $2\text{cis}\dfrac{3\pi}{4}$
D) $2\text{cis}\dfrac{2\pi}{3}$ E) $2\text{cis}\dfrac{\pi}{4}$

12. $z = \sin\dfrac{\pi}{6} - i\cos\dfrac{\pi}{6}$

$z = r \cdot \text{cis}\theta$

$\Rightarrow z = ?$

A) $\text{cis}\dfrac{\pi}{3}$ B) $\text{cis}\dfrac{3\pi}{4}$ C) $\text{cis}\dfrac{7\pi}{6}$
D) $\text{cis}\dfrac{\pi}{6}$ E) $\text{cis}\dfrac{5\pi}{3}$

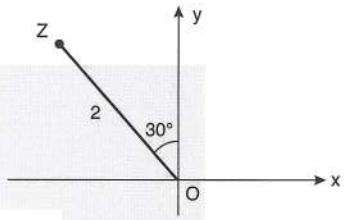
13. $z = \sin\dfrac{\pi}{3} - i\cos\dfrac{\pi}{3}$

$z = r \cdot \text{cis}\theta$

$\Rightarrow z = ?$

A) $\text{cis}\dfrac{11\pi}{6}$ B) $\text{cis}\dfrac{5\pi}{6}$ C) $\text{cis}\dfrac{5\pi}{3}$
D) $\text{cis}\dfrac{2\pi}{3}$ E) $\text{cis}\dfrac{\pi}{3}$

14.

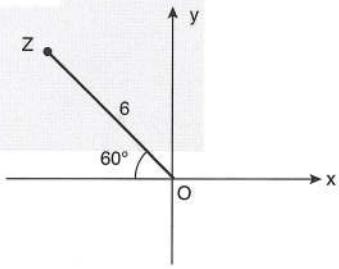


$z = r \cdot \text{cis}\theta$

$\Rightarrow z = ?$

A) 2cis30° B) $2\sqrt{2}$cis30°
C) $2\sqrt{2}$cis120° D) 2cis120°
E) 2cis150°

15.

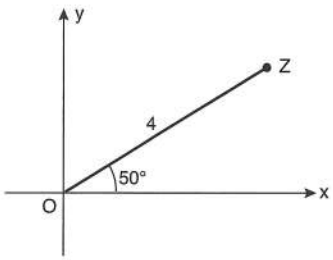


$z = (r, \theta)$

$\Rightarrow z^2 = ?$

A) (6, 120°) B) (6, 240°) C) (36, 210°)
D) (36, 240°) E) (36, 150°)

16.



$z = r \cdot \text{cis}\theta$

$\Rightarrow \sqrt{z} = ?$

A) 4cis50° B) 4cis25° C) 2cis50°
D) $4\sqrt{2}$cis40° E) 2cis25°

1. $z = 4(\sin 70° + i\cos 70°)$

$\Rightarrow \text{Arg}(z) = ?$

A) 20° B) 35° C) 45° D) 60° E) 70°

2. $z = r \cdot \text{cis}\theta$

$\Rightarrow \text{Arg}(-z) + \text{Arg}(\bar{z}) = ?$

A) $-\theta$ B) θ C) 2θ D) $\frac{\pi}{2}$ E) π

3. $z = 2(\cos 40° - i\sin 40°)$

$\Rightarrow \text{Arg}(z) = ?$

A) 20° B) 40° C) 50° D) 310° E) 320°

4. $z = -5(\cos 50° + i\sin 50°)$

$\Rightarrow \text{Arg}(z) = ?$

A) 40° B) 50° C) 130° D) 220° E) 230°

5. $z_1 = 3 \cdot \text{cis}\frac{\pi}{3}$

$z_2 = 2 \cdot \text{cis}\frac{\pi}{2}$

$\Rightarrow \text{Arg}(z_1 \cdot z_2) = ?$

A) π B) $\frac{5\pi}{6}$ C) $\frac{2\pi}{3}$ D) $\frac{\pi}{3}$ E) $\frac{\pi}{6}$

6. $z_1 = 4 \cdot \text{cis}\left(\frac{\pi}{4}\right)$

$z_2 = 2 \cdot \text{cis}\left(\frac{\pi}{3}\right)$

$\Rightarrow \text{Arg}\left(\frac{z_2}{z_1}\right) = ?$

A) $\frac{\pi}{12}$ B) $\frac{\pi}{6}$ C) $\frac{\pi}{5}$ D) $\frac{\pi}{4}$ E) $\frac{\pi}{3}$

7. $z = 2 \cdot \left(\cos\frac{\pi}{12} + i\sin\frac{\pi}{12}\right)$

$\Rightarrow \text{Arg}(z^{30}) = ?$

A) $\frac{\pi}{4}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{2}$ D) $\frac{2\pi}{3}$ E) π

8. $z_1 = r_1 \cdot \text{cis}\alpha$

$z_2 = r_2 \cdot \text{cis}\beta$

$\Rightarrow \text{Arg}\left(\frac{z_1^3}{z_2}\right) = ?$

A) $\frac{\alpha^3}{\beta}$ B) $\frac{3\alpha}{\beta}$ C) $3\alpha - \beta$ D) $3\alpha + \beta$ E) $3\alpha\beta$

9. $z_1 = 3 \cdot (\cos 15° + i\sin 15°)$
$z_2 = 2 \cdot (\cos 75° + i\sin 75°)$
$\Rightarrow z_1 \cdot z_2 = ?$

A) 6 B) – 6 C) 6i D) – 6i E) 1

10. $z_1 = 6 \cdot (\cos 105° + i\sin 105°)$
$z_2 = 2 \cdot (\cos 15° + i\sin 15°)$
$\Rightarrow \dfrac{z_1}{z_2} = ?$

A) 3 B) 3i C) 12 D) 12i E) – 3

11. $z = 2 \cdot (\cos 15° + i\sin 15°)$
$\Rightarrow z^{12} = ?$

A) – 2 B) 2^{12} C) $2^{12} \cdot i$ D) -2^{12} E) 2i

12. $z = 4 \cdot \text{cis}\dfrac{\pi}{3}$
$\Rightarrow \text{Arg}(\sqrt{z}) = ?$

A) $\left\{\dfrac{\pi}{3}, \dfrac{\pi}{6}\right\}$ B) $\left\{\dfrac{\pi}{6}, \dfrac{7\pi}{6}\right\}$ C) $\left\{\dfrac{\pi}{6}, \dfrac{\pi}{12}\right\}$
D) $\left\{\dfrac{\pi}{3}, \dfrac{\pi}{4}\right\}$ E) $\left\{\dfrac{2\pi}{3}, \dfrac{4\pi}{3}\right\}$

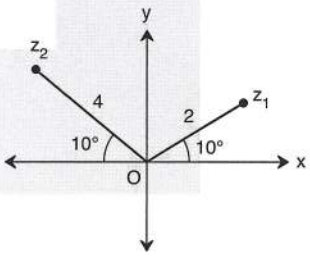
13. $z = 1 + i$
$\Rightarrow z^{18} = ?$

A) -2^9 B) 2^9 C) $-2^9 i$ D) $2^9 i$ E) i

14. $z = 1 + \sqrt{3}i$
$\Rightarrow z^{63} = ?$

A) $2^{63} i$ B) 2^{63} C) -2^{63} D) $-2^{63} i$ E) 0

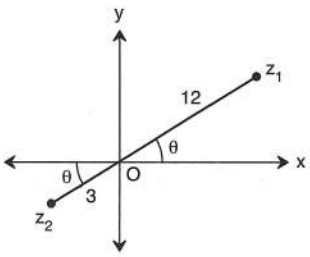
15.



$\Rightarrow z_1 \cdot z_2 = ?$

A) – 8 B) 8 C) 8i D) – 8i E) 2i

16.



$\Rightarrow \dfrac{z_1}{z_2} = ?$

A) – 4i B) – 4 C) $-\dfrac{1}{4}$ D) $\dfrac{1}{4}$ E) 4

1. $i^2 = -1$

$z = -9$

karmaşık sayısının kareköklerî aşağıdakilerden hangisidir?

Which of the following is one of the square root of the complex number above?

A) $\{-i, i\}$ B) $\{1 - i, 1 + i\}$

C) $\{3i, -3i\}$ D) $\{\sqrt{3}i, -i\}$

E) $\{1, -1\}$

2. $z = 9(\cos 300° + i\sin 300°)$

karmaşık sayısının kareköklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of the square roots of the complex number above?

A) $\frac{-\sqrt{3}+i}{2}$ B) $\sqrt{3} - i$

C) $-3\sqrt{3} + 3i$ D) $-\frac{3\sqrt{3}}{2} + \frac{3}{2}i$

E) $\frac{-1}{3} + \frac{\sqrt{3}}{3}i$

3. $z = \sqrt{3} + i$

karmaşık sayısının kareköklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of the square roots of the complex number above?

A) $\sqrt{2}\,\text{cis}15°$ B) $2\text{cis}30°$ C) $\sqrt{2}\,\text{cis}75°$

D) $\text{cis}195°$ E) $2\text{cis}185°$

4. $z = 4i$

karmaşık sayısının kareköklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of the square roots of the complex number above?

A) $2 - 2i$ B) $1 - i$ C) $1 + i$

D) $2 + i$ E) $\sqrt{2} + \sqrt{2}i$

5. $z = -2 + 2\sqrt{3}i$

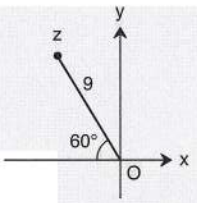
karmaşık sayısının kareköklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of the square root of the complex number above?

A) $1 - i$ B) $1 + \sqrt{3}i$ C) $1 - \sqrt{3}i$

D) $-1 + \sqrt{3}i$ E) $2 + 2i$

6.



z karmaşık sayısının kareköklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of the square roots of z complex number?

A) $3 + 3\sqrt{3}i$ B) $1 + \sqrt{3}i$ C) $1 - \sqrt{3}i$

D) $\frac{3\sqrt{3}}{2} + \frac{3}{2}i$ E) $\frac{3}{2} + \frac{3\sqrt{3}}{2}i$

7. $z^2 = 4i$

denkleminin köklerinden biri aşağıdakilerden hangisi olabilir?

Which of the following could be one of the roots of $z^2 = 4i$ equation?

A) $-\sqrt{2} - \sqrt{2}i$ B) $\sqrt{2} - \sqrt{2}i$

C) $-\sqrt{2}i$ D) $\sqrt{3} - \sqrt{3}i$

E) $\sqrt{3} - 2i$

8. $z = \frac{\sqrt{3} + 3i}{\sqrt{3}}$ karmaşık sayısının kareköklerî nedir?

What are the square roots of $z = \frac{\sqrt{3} + 3i}{\sqrt{3}}$ complex number?

A) $\sqrt{2}\,\text{cis}15°$
$\sqrt{2}\,\text{cis}195°$

B) $2\text{cis}30°$
$2\text{cis}210°$

C) $\sqrt{2}\,\text{cis}60°$
$\sqrt{2}\,\text{cis}240°$

D) $\sqrt{2}\,\text{cis}30°$
$\sqrt{2}\,\text{cis}210°$

E) $2\text{cis}30°$
$2\text{cis}240°$

9. $z = \dfrac{8}{1+\sqrt{3}i}$

karmaşık sayısının kareköklerinden biri nedir?

Which of the following is one of the square roots of the complex number above?

A) $-1-\sqrt{3}i$ B) $-1+\sqrt{3}i$

C) $\sqrt{3}-i$ D) $2\sqrt{3}i$

E) $-1+3i$

10. $z = 4(\cos 72° + i\sin 72°)$

$\bar{z}$ karmaşık sayısının kareköklerinden biri nedir?

Which of the following is one of the square roots of $\bar{z}$ complex number?

A) 2cis36° B) 2cis72° C) 2cis144°

D) 4cis324° E) 4cis162°

11. $z = 27(\cos 120° + i\sin 120°)$

karmaşık sayısının küp köklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of the cube roots of $z = 27(\cos 120° + i\sin 120°)$ complex number?

A) 27cis40° B) 27cis120° C) 3cis160°

D) 27cis160° E) 3cis240°

12. $z = \cos 120° + i\sin 120°$

karmaşık sayısının küp köklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of cube roots of $z = \cos 120° + i\sin 120°$ complex number?

A) cis280° B) cis200° C) cis180°

D) cis100° E) cis50°

13. $z = 1 - i$

$\bar{z}$ karmaşık sayısının küp köklerinden biri nedir?

Which of the following is one of the cube roots of $\bar{z}$ complex number?

A) $\sqrt[3]{2}\,\text{cis}\dfrac{\pi}{4}$ B) $\sqrt[6]{2}\,\text{cis}\dfrac{3\pi}{4}$

C) $\sqrt[6]{2}\,\text{cis}\dfrac{2\pi}{3}$ D) $\sqrt[3]{2}\,\text{cis}\dfrac{3\pi}{4}$

E) $\sqrt[6]{2}\,\text{cis}\dfrac{\pi}{4}$

14. $z = \cos\dfrac{\pi}{3} - i\sin\dfrac{\pi}{3}$

karmaşık sayısının küpköklerinden biri nedir?

Which of the following is one of the cube roots of $z = \cos\dfrac{\pi}{3} - i\sin\dfrac{\pi}{3}$ complex number?

A) $\text{cis}\dfrac{4\pi}{3}$ B) $\text{cis}\dfrac{\pi}{9}$ C) $\text{cis}\dfrac{11\pi}{9}$

D) $\text{cis}\dfrac{5\pi}{3}$ E) $\text{cis}\dfrac{\pi}{3}$

15. $z = 3 - 4i$

karmaşık sayısının kareköklerinden biri aşağıdakilerden hangisidir?

Which of the following is one of the square roots of $z = 3 - 4i$ complex number?

A) $1 + i$ B) $2 - i$ C) $2 + i$

D) $-1 + i$ E) $-1 + 2i$

16. $z^2 = 5 + 8i$

denkleminin kökleri oranı nedir?

What is the ratio of the roots of $z^2 = 5 + 8i$ equation?

A) -1 B) $-\dfrac{1}{2}$ C) $\dfrac{1+i}{2}$ D) $\dfrac{i}{2}$ E) 2

1. $i^2 = -1$

$(1+i)^8 \cdot (1-i)^8 = ?$

A) -2^8 B) $-2^8 i$ C) 0 D) $2^8 i$ E) 2^8

2. $z = \dfrac{1-2i}{1+i}$

$\Rightarrow \text{Re}(z) = ?$

A) -2 B) $-\dfrac{3}{2}$ C) $-\dfrac{1}{2}$ D) 1 E) $\dfrac{3}{2}$

3. $z = \dfrac{1}{2-\sqrt{3}i}$

$\Rightarrow \overline{z} = ?$

A) $2+\sqrt{3}i$ B) $2+2\sqrt{3}i$ C) $\dfrac{1}{2}-\dfrac{\sqrt{3}}{2}i$ D) $\dfrac{2+\sqrt{3}i}{7}$ E) $\dfrac{2-\sqrt{3}i}{7}$

4. $i^2 = -1$

$(1+i^3)\cdot(1+i^{10})\cdot(1+i^{11})\cdot(1+i^{12}) = ?$

A) -5 B) -3 C) 0 D) 1 E) 2

5. $z = \dfrac{(3-4i)\cdot(6-8i)}{(3+i)^2}$

$\Rightarrow |z| = ?$

A) 5 B) 10 C) 15 D) 25 E) 30

6. $(1+3i)\cdot z = \overline{z} - 6i + 9$

$\Rightarrow \text{Im}(z) = ?$

A) 11 B) $-3i$ C) $-2i$ D) -3 E) -11

7. $z = x + iy$

$|z+3-2i| = 6$

Karmaşık sayılarının geometrik yer denklemi aşağıdakilerden hangisidir?

Which of the following is the geometrical equation of complex numbers?

A) $(x+3)^2 + (y+2)^2 = 36$ B) $(x-3)^2 + (y+2)^2 = 36$
C) $(x+3)^2 + (y-2)^2 = 36$ D) $(x+3)^2 + (y+2)^2 = 4$
E) $(x-2)^2 + (y+3)^2 = 36$

8. $\dfrac{\sqrt{-9}+\sqrt{-16}}{-\sqrt{-25}} = ?$

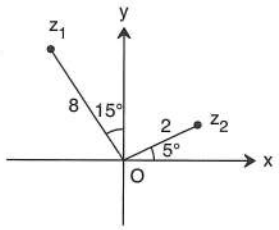
A) $\dfrac{3}{2}(1+i)$ B) $\dfrac{5}{2}(1-i)$ C) $-\dfrac{7}{5}$ D) $\dfrac{7}{5}$ E) $1-i$

9. $z = 2(\cos 120° + i\sin 120°)$

$\Rightarrow z^3 = ?$

A) 8 B) 8i C) 8(1 + i) D) 8(1 – i) E) –8

10.



$\Rightarrow \dfrac{z_1}{z_2^3} = ?$

A) 8i B) 8 C) – i D) 1 E) i

11. $|z| + z = 8 - 4i$

$\Rightarrow z = ?$

A) 3 – i B) 3 + 4i C) 2 – 3i D) 3 – 4i E) 6 – 8i

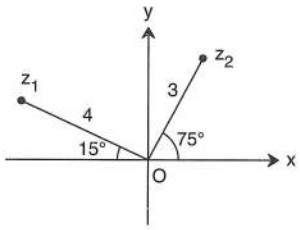
12. $z = 3 + 4i$

karmaşık sayısının kareköklerinden biri nedir?

Which of the following is one of the roots of $z = 3 + 4i$ complex number?

A) 1 – i B) 2 – i C) 2 + 3i D) 2 + i E) 6 – 3i

13.



$\Rightarrow |z_1 + z_2| = ?$

A) 5 B) $\frac{5}{2}$ C) 6 D) 10 E) $3\sqrt{2}$

14. $z = \dfrac{1+2i}{1-2i}$

$\Rightarrow z = ?$

A) – 1 B) – 3 + 4i C) $-\frac{3}{5}+\frac{4i}{5}$ D) 2 – 2i E) $\frac{2-2i}{5}$

15. $z = 4 - 3i$

karmaşık sayısının esas argumenti α ise $\cos(2\alpha)$ kaçtır?

If the principal argument of $z = 4 - 3i$ complex number is "a" what is $\cos(2a)$?

A) –1 B) $-\frac{7}{25}$ C) $-\frac{12}{13}$ D) $\frac{5}{13}$ E) $\frac{7}{25}$

16. $z = \dfrac{2i}{5+5\sqrt{3}i}$

$\Rightarrow \text{Arg}(z) = ?$

A) $\frac{\pi}{6}$ B) $\frac{\pi}{5}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{3}$ E) $\frac{\pi}{2}$

1. $n \in N$

$\Rightarrow \dfrac{i^{9n}+i^{n+9}}{i^{13n}+i^{n+9}} = ?$

A) -1 B) 1 C) i D) $-i$ E) 2

2. $z_1 = 2-\sqrt{3}i$

$z_2 = 3-\sqrt{5}i$

$\Rightarrow \left|\dfrac{z_1}{z_2}\right| = ?$

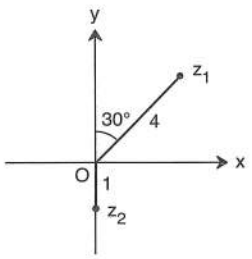
A) $\sqrt{2}$ B) $\dfrac{\sqrt{2}}{2}$ C) 1 D) 2 E) 4

3. $\dfrac{\bar{z}-iz}{2} = z+\dfrac{3}{2}$

$\Rightarrow z = ?$

A) $4+3i$ B) $4-3i$ C) $\dfrac{4+i}{3}$ D) $\dfrac{4-i}{3}$ E) $\dfrac{-9+3i}{4}$

4.



$|z_1| = 4$ br

$|z_2| = 1$ br

$\Rightarrow z_1^{\,3} \cdot z_2 = ?$

A) $-64i$ B) $64i$ C) 64 D) 16 E) $16i$

5. $z = 1+\sqrt{3}i$

$\Rightarrow (\bar{z})^6 = ?$

A) $2^5(-\sqrt{3}+i)$ B) -2^6 C) $2^5(\sqrt{2}+\sqrt{2}i)$ D) $2^5(1+\sqrt{3}i)$ E) 2^6

6. $z \cdot \bar{z} = |z| + 20$

$\Rightarrow |z| = ?$

A) 5 B) 6 C) 10 D) 15 E) 20

7. $z_1 = 3\left(\cos\dfrac{\pi}{6}+i\sin\dfrac{\pi}{6}\right)$

$z_2 = 2\left(\cos\dfrac{\pi}{3}+i\sin\dfrac{\pi}{3}\right)$

$\Rightarrow \text{Arg}(z_1 \cdot z_2) = ?$

A) $\dfrac{\pi}{12}$ B) $\dfrac{\pi}{3}$ C) $\dfrac{\pi}{2}$ D) π E) $\dfrac{3\pi}{2}$

8. $\sqrt{8-\sqrt{-192}} = ?$

A) $-2\sqrt{3}+2i$ B) $2\sqrt{2}-2\sqrt{2}i$ C) $2+2i$ D) $2i-2$ E) $4i$

9. $\text{Arg}(z_1 \cdot z_2) = \frac{2\pi}{3}$

$\text{Arg}\left(\frac{z_1}{z_2}\right) = \frac{\pi}{6}$

$\Rightarrow \text{Arg}(z_1) = ?$

A) $\frac{\pi}{4}$ B) $\frac{3\pi}{5}$ C) $\frac{5\pi}{12}$ D) $\frac{3\pi}{8}$ E) $\frac{2\pi}{7}$

10. $z = 2 + i$

$\Rightarrow \left(\frac{z+\bar{z}}{z-\bar{z}}\right)^4 = ?$

A) -16 B) $-16i$ C) $16i$ D) 16 E) 1

11. $1 + i + i^2 + i^3 + \ldots + i^{78} = ?$

A) $-i$ B) -1 C) 0 D) 1 E) i

12. $(\sqrt{z} + i)3 + 1 = |z|$

$\Rightarrow z = ?$

A) $1 + i$ B) $1 - i$ C) $2 - 4i$ D) $3 - i$ E) $8 - 6i$

13. $z = -2 - 2\sqrt{3}\,i$

karmaşık sayısının kareköklerinden biri nedir?

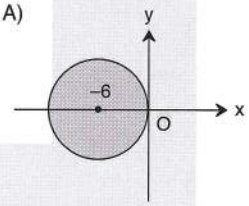
Which of the following is one of the square roots of $z = -2 - 2\sqrt{3}\,i$ complex number?

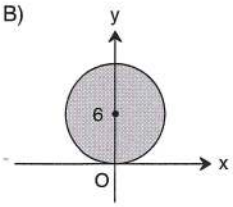
A) $-1 + \sqrt{3}\,i$ B) $1 + \sqrt{3}\,i$ C) $\sqrt{3} - i$ D) $\sqrt{2}(1 - i)$ E) $\sqrt{2}(1 + i)$

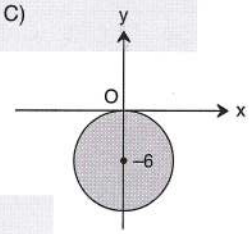
14. $|z - 6i| \leq 6$

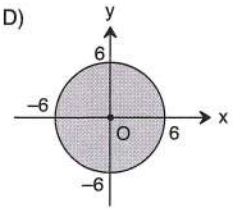
koşulunu sağlayan z karmaşık sayıların koordinat düzleminde gösterimi aşağıdakilerden hangisidir?

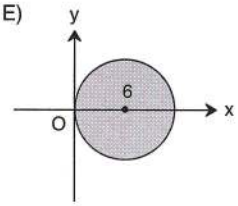
Which of the following is the graph on the coordinate plane of the complex numbers "z" which meets $|z - 6i| \leq 6$ condition ?

A)


B)


C)


D)


E)


15. $z = \sin 50° + (1 + \cos 50°)i$

$\Rightarrow \text{Arg}(z) = ?$

A) $25°$ B) $40°$ C) $65°$ D) $70°$ E) $85°$

KARMAŞIK SAYILAR
COMPLEX NUMBERS

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	C	E	D	C	E	E	C	A	A	D	E	D	C	C	D

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	E	C	E	C	C	E	E	C	B	A	D	A	C	E

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	D	E	A	D	E	E	C	E	E	E	E	C	E	E

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	A	C	A	D	E	B	A	E	A	E	E	D	B	A	A

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	E	D	B	C	E	D	C	C	A	C	B	C	B	E

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	C	C	E	E	E	E	C	B	A	C	B	E	A	B	B

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	E	A	E	A	D	A	C	E	E	E	C	D	A	C

TEST 8

1	2	3	4	5	6	7	8	9
B	A	B	B	E	D	C	C	A

TEST 9

1	2	3	4	5	6	7	8	9	10	11
B	D	E	B	A	B	E	A	D	E	C

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	A	D	E	E	B	B	E	E	A	E	A	D	D	E

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	E	E	B	A	C	C	C	B	D	B	D	C	A	B

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	A	E	B	E	A	D	C	C	C	A	B	C	B	A

TEST 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	C	E	C	A	D	C	C	A	E	D	D	A	C	E	A

TEST 14

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	B	E	B	E	A	C	A	C	D	E	E	A	B	C

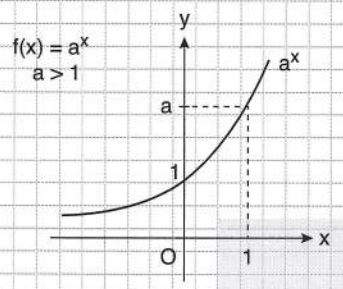
LOGARİTMA

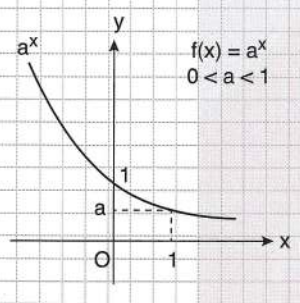
LOGARITHM

LOGARİTMA

ÖZELLİK | Property 1

Üstel Fonksiyon ve Logaritma
Exponential Function and Logarithm





Üstel fonksiyonun tersi logaritma fonksiyonudur.

Logarithmic function is the inverse exponential function.

Logaritma fonksiyonun tersi de üstel fonksiyondur.

Also exponential function is inverse logarithmic function.

$$a^x = y \Leftrightarrow x = \log_a y$$

Örnek | Example

1. $2^x = 3 \Rightarrow x = \log_2 3$
2. $5^x = 7 \Rightarrow x = \log_5 7$
3. $\log_2 x = 3 \Rightarrow x = 2^3$
4. $\log_3 x = 5 \Rightarrow x = 3^5$

1. $2^x = 5$
$\Rightarrow x = ?$ — $\log_2 5$

2. $5^x = 3$
$\Rightarrow x = ?$ — $\log_5 3$

3. $2^{x+1} = 3$
$\Rightarrow x = ?$ — $\log_2 \frac{3}{2}$

4. $3^{x-1} = 8$
$\Rightarrow x = ?$ — $\log_3 24$

5. $3^{-x} = 5$
$\Rightarrow x = ?$ — $\log_3 \frac{1}{5}$

6. $7^{1-x} = 2$
$\Rightarrow x = ?$ — $\log_7 \frac{7}{2}$

7. $5^{x+2} = 50$
$\Rightarrow x = ?$ — $\log_5 2$

8. $7^{x-1} = 3$
$\Rightarrow x = ?$ — $\log_7 21$

9. $\log_2 x = 3$
$\Rightarrow x = ?$ — 8

10. $\log_3 x = 1$
$\Rightarrow x = ?$ — 3

11. $\log_6 x + 2 = 0$
$\Rightarrow x = ?$ — $\frac{1}{36}$

12. $\log_{\frac{1}{3}} 27 = x$
$\Rightarrow x = ?$ — -3

13. $\log_3(\log_4 x) = 1$
$\Rightarrow x = ?$ — 64

14. $\log_4(1 + \log_2(x - 2)) = 1$
$\Rightarrow x = ?$ — 10

ÖZELLİK | Property 2

$a \in R^+ \setminus \{1\}$

- $\log_a a = 1$
- $\log_a 1 = 0$
- $\log_a a^n = n \cdot \log_a a = n$
- $\log_a b^n = n \cdot \log_a b$
- $\log_{(a^n)}(b^m) = \frac{m}{n} \log_a b$

1. $\log_2 4 = ?$ — 2

2. $\log_3 \sqrt{3} = ?$ — $\frac{1}{2}$

3. $\log_5 \frac{1}{5} = ?$ — -1

4. $\log_7 49 = ?$ — 2

5. $\log_{\frac{1}{7}} 7 = ?$ — -1

6. $\log_4 8 = ?$ — $\frac{3}{2}$

7. $\log_{\sqrt{3}} 9$ — 4

8. $\log_5 1 = ?$ — 0

9. $\log_4 \frac{1}{16} = ?$ — -2

10. $\log_{\frac{1}{3}} \frac{1}{\sqrt{3}} = ?$ — $\frac{1}{2}$

11. $\log_4 2 = ?$ — $\frac{1}{2}$

12. $\log_{27} 81 = ?$ — $\frac{4}{3}$

13. $\log_5 125 + \log_2 \frac{1}{8} = ?$ — 0

14. $\log_2 4 + \log_6 36 = ?$ — 4

15. $\log_{16} 2 + \log_9 3 = ?$ — $\frac{3}{4}$

16. $\log_{81} 27 + \log_{16} 2 = ?$ — 1

17. $\log_{\sqrt{2}} \sqrt{2} + \log_2 \sqrt{2} = ?$ — $\frac{3}{2}$

18. $\frac{\log_3 27 - \log_2 4}{\log_5 125} = ?$ — $\frac{1}{3}$

19. $\log_{\frac{1}{8}} \frac{1}{2} - \log_{\frac{1}{3}} \frac{1}{9} = ?$ — $\frac{-5}{3}$

LOGARİTMA

ÖZELLİK | Property 3

$\log a = \log_{10} a$

$\log 100 = \log_{10} 10^2 = 2$

$\log \frac{1}{10} = \log 10^{-1} = -1$

$\log 0{,}00001 = \log 10^{-5} = -5$

$\ln a = \log_e a \rightarrow$ Doğal logaritma *(Natural logarithm)*

$e = 2{,}718281...$

$\ln e = 1$

$\ln \frac{1}{e^2} = \ln e^{-2} = -2$

$\ln e^{-5} = -5$

$\ln 1 = 0$

1. $\ln e^2 - \log_{25} 5 = ?$ $\boxed{\frac{3}{2}}$

2. $\log 100 + \log_{216} 36 = ?$ $\boxed{\frac{8}{3}}$

3. $\log_3 3 + \log 10 = ?$ $\boxed{2}$

4. $\log 10 + \log_2 8 = ?$ $\boxed{4}$

5. $\ln e^2 + \ln \frac{1}{e} - \ln e^3 = ?$ $\boxed{-2}$

6. $\ln e^3 - \log_4 64 = ?$ $\boxed{0}$

ÖZELLİK | Property 4

- $\log_a b + \log_a c = \log_a (b \cdot c)$
- $\log_a b - \log_a c = \log_a \left(\frac{b}{c}\right)$

1. $\log 2 + \log 5 = ?$ $\boxed{1}$

2. $\log_6 4 + \log_6 9 = ?$ $\boxed{2}$

3. $\log_2 12 - \log_2 3 = ?$ $\boxed{2}$

4. $\log_3 15 + \log_3 6 - \log_3 10 = ?$ $\boxed{2}$

5. $\log 2 = x$
$\log 3 = y$
$\Rightarrow \log 12 = ?$ $\boxed{2x + y}$

6. $\log(2x + 1) - \log(x + 2) = 0$
$\Rightarrow x = ?$ $\boxed{1}$

7. $\log 3 = x$
$\log 5 = y$
$\Rightarrow \log 150 = ?$ $\boxed{x + y + 1}$

ÖZELLİK | Property 5

Taban Değiştirme | Changing Base

- $\log_a b = \dfrac{\log_c b}{\log_c a}$ $\quad c \in R^+ \setminus \{1\}$
- $\log_a b = \dfrac{\log_{10} b}{\log_{10} a} = \dfrac{\log b}{\log a}$

1. $\log_2 3 \cdot \log_3 5 \cdot \log_5 8 = ?$ $\quad \boxed{3}$

2. $\log_3 x \cdot \log_x 9 = ?$ $\quad \boxed{2}$

3. $\log_9 4 \cdot \log_2 27 = ?$ $\quad \boxed{3}$

4. $\log_3 5 \cdot \log_2 9 \cdot \log_{25} 2 = ?$ $\quad \boxed{1}$

5. $\log_{25} 3 \cdot \log_9 7 \cdot \log_7 5 = ?$ $\quad \boxed{\frac{1}{4}}$

6. $\log_3 8 \cdot \log_4 5 \cdot \log_{25} 27 = ?$ $\quad \boxed{\frac{9}{4}}$

7. $\log_3 5 \cdot \log_5 6 \cdot \log_6 27 = ?$ $\quad \boxed{3}$

8. $\log_4 3 \cdot \log_x 5 \cdot \log_5 16 = 2$
$\Rightarrow x = ?$ $\quad \boxed{3}$

ÖZELLİK | Property 6

$$\log_a b = \frac{\log b}{\log a} = \frac{1}{\frac{\log a}{\log b}} = \frac{1}{\log_b a}$$

1. $\dfrac{1}{\log_4 5} = 2\log_5 x$
$\Rightarrow x = ?$ $\quad \boxed{2}$

2. $\dfrac{\log_3 5}{\log_9 125} = ?$ $\quad \boxed{\frac{2}{3}}$

3. $\dfrac{1}{\log_5 3} + \log_3\left(\frac{9}{5}\right) = ?$ $\quad \boxed{2}$

4. $\dfrac{1}{\log_3 6} + \dfrac{1}{\log_2 6} = ?$ $\quad \boxed{1}$

5. $\log_2\left(\dfrac{1}{\log_{25} 5}\right) = ?$ $\quad \boxed{1}$

6. $\log_2 5 = x$
$\Rightarrow \log_5 32 = ?$ $\quad \boxed{\frac{5}{x}}$

7. $\log_3 2 = x$
$\Rightarrow \log_2 9 = ?$ $\quad \boxed{\frac{2}{x}}$

8. $\log_2 3 = x$
$\Rightarrow \log_{12} 18 = ?$ $\quad \boxed{\frac{1+2x}{2+x}}$

ÖZELLİK | Property 7

- $a^{\log_a b} = b$
- $a^{\log_b c} = c^{\log_b a}$

  $a \leftrightarrow c$

1. $2^{\log_2 5} = ?$ — 5

2. $9^{\log_3 2} = ?$ — 4

3. $2^{\log_2 25} - 3^{\log_9 16} = ?$ — 21

4. $5^{\log_5[\log_3 9]} = ?$ — 2

5. $e^{1 + \ln(2x+2)} = 6 \cdot e$

$\Rightarrow x = ?$ — 2

6. $2^{\log x} + x^{\log 2} = 8$

$\Rightarrow x = ?$ — 100

7. $2^{\ln x} + 3 \cdot x^{\ln 2} - 8 = 0$

$\Rightarrow x = ?$ — e

ÖZELLİK | Property 8

$f(x) = \log_{g(x)} h(x)$

logaritma fonksiyonunun en geniş tanım kümesi bulunurken aşağıdaki özellikler dikkate alınır.

While the widest set of definition of a logarithmic function is found following properties should be considered.

- $g(x) > 0$
- $h(x) > 0$
- $g(x) \neq 1$

Aşağıda verilen fonksiyonların en geniş tanım kümesini bulunuz.

What is the widest set of definition in following functions?

1. $f(x) = \log_2(x - 3)$ — $(3, \infty)$

2. $f(x) = \log_4(5 - x)$ — $(-\infty, 5)$

3. $f(x) = \log_{(x-4)} 7$ — $(4, \infty) \setminus \{5\}$

4. $f(x) = \log_x 9$ — $R^+ \setminus \{1\}$

5. $f(x) = \log_{(x-7)}(20 - x)$ — $(7, 20) \setminus \{8\}$

6. $f(x) = \log_{(x^2)}(x + 3)$ — $(-3, \infty) \setminus \{1, 0, -1\}$

ÖZELLİK | Property 9

$a \in R^+ \setminus \{1\}$

$f(x) = a^x \Rightarrow f^{-1}(x) = \log_a x$

$f(x) = \log_a x \Rightarrow f^{-1}(x) = a^x$

1. $f(x) = 3^x$
   $\Rightarrow f^{-1}(x) = ?$ — $\log_3 x$

2. $f(x) = 2^{x+1}$
   $\Rightarrow f^{-1}(x) = ?$ — $\log_2 \frac{x}{2}$

3. $f(x) = 4^{x-1} + 1$
   $\Rightarrow f^{-1}(x) = ?$ — $\log_4(x-1) + 1$

4. $f(x) = 2^{x-1} + 3$
   $\Rightarrow f^{-1}(19) = ?$ — 5

5. $f(x) = \log_3 x$
   $\Rightarrow f^{-1}(x) = ?$ — 3^x

6. $f(x) = \log_2 x - 1$
   $\Rightarrow f^{-1}(x) = ?$ — 2^{x+1}

7. $f(x) = \log_3 x + 2$
   $\Rightarrow f^{-1}(x) = ?$ — 3^{x-2}

8. $f(x) = \log_4(x-1)$
   $\Rightarrow f^{-1}(2) = ?$ — 17

ÖZELLİK | Property 10

$a \in R^+ \setminus \{1\}$

$\log_a x = 0 \Rightarrow x = 1$

$\log_a x = 1 \Rightarrow x = a$

1. $\log_2(2x-5) = 0$
   $\Rightarrow x = ?$ — 3

2. $\log_6(3x+1) = 0$
   $\Rightarrow x = ?$ — 0

3. $\log_4(x-2) = 0$
   $\Rightarrow x = ?$ — 3

4. $\log_{(x+2)}(2x-1) = 1$
   $\Rightarrow x = ?$ — 3

5. $\log_{(3x-1)}(2x+2) = 1$
   $\Rightarrow x = ?$ — 3

6. $\log_{(2x+4)}(3x-1) = 1$
   $\Rightarrow x = ?$ — 5

7. $\log_{(x^2)}(4x-4) = 1$
   $\Rightarrow x = ?$ — 2

8. $\log_{(x^2)}(6x-9) = 1$
   $\Rightarrow S.S. = ?$ — 3

LOGARİTMA

ÖZELLİK | Property 11

$$\log_a b = t \Rightarrow \log_b a = \frac{1}{t}$$

1. $\log_2 x + \log_x 2 = -2$
$\Rightarrow x = ?$

$\boxed{\frac{1}{2}}$

2. $3^{\ln x} + \frac{1}{3^{\ln x}} = \frac{10}{3}$
$\Rightarrow$ S.S. = ?

$\boxed{\left\{\frac{1}{e}, e\right\}}$

3. $\log_2 x + \log_x 4 = 3$
$\Rightarrow$ S.S. = ?

$\boxed{\{2, 4\}}$

4. $x^{\log_4 x} = 4$
$\Rightarrow$ S.S. = ?

$\boxed{\left\{\frac{1}{4}, 4\right\}}$

5. $x^{\log_3 x} = 81$
$\Rightarrow$ S.S. = ?

$\boxed{\left\{\frac{1}{9}, 9\right\}}$

6. $x^{1-\log_2 x} = \frac{1}{4}$
$\Rightarrow$ S.S. = ?

$\boxed{\left\{\frac{1}{2}, 4\right\}}$

7. $(x+1)^{\log_2(x+1)} = 16$
$\Rightarrow$ S.S. = ?

$\boxed{\left\{3, -\frac{3}{4}\right\}}$

8. $(x+2)^{\log_3(x+2)} = 81$
$\Rightarrow$ S.S. = ?

$\boxed{\left\{7, -\frac{17}{9}\right\}}$

ÖZELLİK | Property 12

$0 < a$

$a^x < a^y \xrightarrow{1 < a} x < y$

$a^x < a^y \xrightarrow{0 < a < 1} x > y$

$0 < a \quad a \neq 1$

$\log_a x < \log_a y \xrightarrow{1 < a} x < y$

$\log_a x < \log_a y \xrightarrow{0 < a < 1} x > y$

logaritmanın tanımından *(from the definition of logarithm)*

$x > 0 \quad y > 0$

1. $\log_2(x-4) > 1$
$\Rightarrow$ S.S. = ?

$\boxed{(6, \infty)}$

2. $\log_2(7-x) > 1$
$\Rightarrow$ S.S. = ?

$\boxed{(-\infty, 5)}$

3. $2 < \log_3(x-1) < 4$
$\Rightarrow$ S.S. = ?

$\boxed{(10, 82)}$

4. $\log_{\left(\frac{1}{2}\right)}(3x-1) < -3$
$\Rightarrow$ S.S. = ?

$\boxed{(3, \infty)}$

5. $\log_{\left(\frac{1}{3}\right)}(2x-1) \geq -2$
$\Rightarrow$ S.S. = ?

$\boxed{\left(\frac{1}{2}, 5\right]}$

6. $\log_2(\log_2(x-1)) < 1$
$\Rightarrow$ S.S. = ?

$\boxed{(2, 5)}$

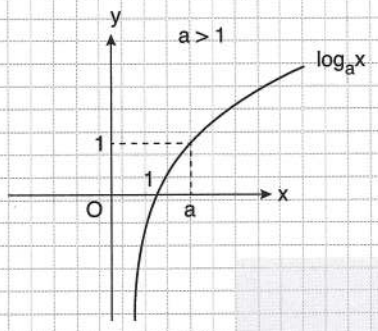
7. $\log_2(\log_3(x-2)) \leq 2$
$\Rightarrow$ S.S. = ?

$\boxed{(3, 83]}$

ÖZELLİK | Property 13

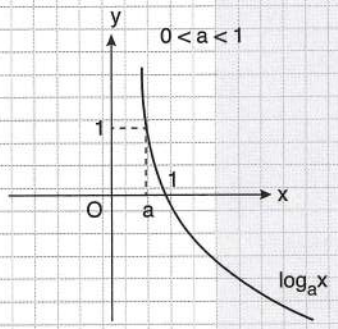
$f(x) = \log_a x$

$a > 1$

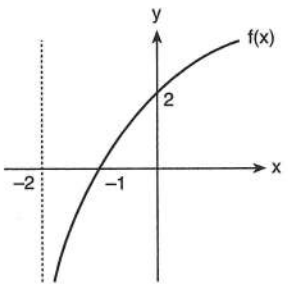


$f(x) = \log_a x$

$0 < a < 1$



1.

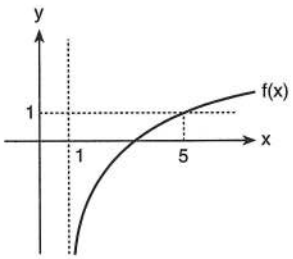


$f(x) = \log_a(x + 2)$

$\Rightarrow a = ?$

$\sqrt{2}$

2.

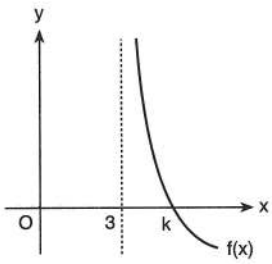


$f(x) = \log_a(x - 1)$

$\Rightarrow a = ?$

4

3.



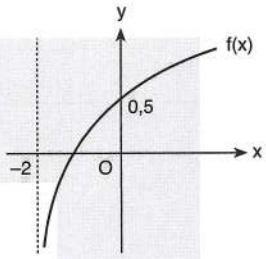
$f(x) = a - \log_3(x - 3)$

$f(12) = 3$

$\Rightarrow a = ?$

5

4.

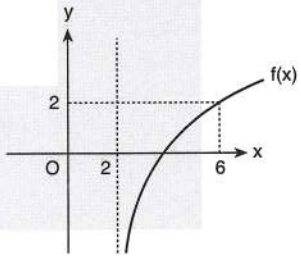


$f(x) = \log_a(x + 2)$

$\Rightarrow f(14) = ?$

2

5.

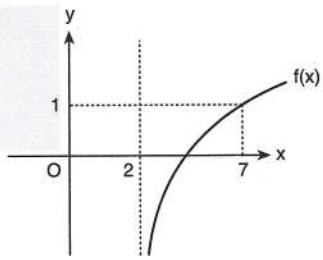


$f(x) = \log_a(x + b)$

$\Rightarrow a + b = ?$

0

6.

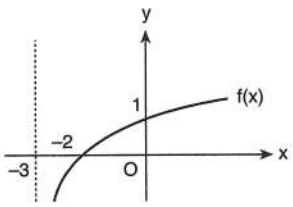


$f(x) = \log_a(x - b)$

$\Rightarrow a \cdot b = ?$

10

7.



$f(x) = \log_a(x + b)$

$\Rightarrow f(24) = ?$

3

LOGARİTMA

ÖZELLİK | Property 14

$\log A = k + m$

$k \in Z$ karakteristik *(characteristic)*

$0 \le m < 1$ mantis *(mantissa)*

Örnek | Example

$\log A = -3{,}46$

$= -3 - 0{,}46$

$= -3 - 1 + 1 - 0{,}46$

$= -4 + 0{,}54$

$= \overline{4}{,}54 \Rightarrow k = -4 \quad m = 0{,}54$

1. $\log x \cong 0{,}201$

$\Rightarrow \log(x^2) = ?$

$\boxed{0{,}402}$

2. $\log 2 \cong 0{,}301$

$\Rightarrow \log 8 = ?$

$\boxed{0{,}903}$

3. $\log x \cong 0{,}24$

$\Rightarrow \log\sqrt{x} = ?$

$\boxed{0{,}12}$

4. $\log x = 3{,}42$

$\Rightarrow -\log x = ?$

$\boxed{\overline{4}{,}58}$

5. $-\log(x^2) = 2{,}44$

$\Rightarrow \log x = ?$

$\boxed{\overline{2}{,}78}$

6. $\log x = \overline{1}{,}24$

$\Rightarrow \log(x^2) = ?$

$\boxed{\overline{2}{,}48}$

7. $\log(x^3) = 6{,}12$

$\Rightarrow \log\left(\frac{1}{x}\right) = ?$

$\boxed{\overline{3}{,}96}$

8. $\log x = 2{,}24$

$\Rightarrow \log\left(\frac{1}{\sqrt{x}}\right) = ?$

$\boxed{\overline{2}{,}88}$

9. $\log x = 3{,}162453$

$\Rightarrow \log\left(\frac{1}{x}\right) = ?$

$\boxed{\overline{4}{,}837547}$

10. $\log(x^2) = 6{,}72$

$\Rightarrow \log(x^{-3}) = ?$

$\boxed{\overline{11}{,}92}$

11. $\log(100 \cdot x) = 1{,}362$

$\Rightarrow \log x = ?$

$\boxed{\overline{1}{,}362}$

12. $\log(10 \cdot x^2) = 0{,}8364$

$\Rightarrow \log\sqrt{x} = ?$

$\boxed{\overline{1}{,}9591}$

ÖZELLİK | Property 15

Kologoritma | Cologorithm

$\log A = x$

$\text{colog}A = -x$

Logaritmadaki özelliklerin tamamı kologaritma için de geçerlidir.

All of the properties of a logarithm are valid also for cologorithm.

$$\text{colog}A = -\log A = \log\frac{1}{A}$$

1. $\log x = \overline{3},14$

$\Rightarrow \text{colog}x = ?$

2,86

2. $\text{colog}x = \overline{2},3101$

$\Rightarrow \log x = ?$

1,6899

3. $\text{colog}10000 = ?$

– 4

4. $\text{colog}x = 3$

$\Rightarrow x = ?$

0,001

5. $\log A = 1,6$

$\Rightarrow \text{colog}A^2 = ?$

$\overline{4},8$

6. $\text{colog}x = 2,5131$

$\Rightarrow \log\sqrt[3]{x^5} = ?$

$\overline{5},8115$

7. $\text{colog}x = \overline{2},1036$

$\Rightarrow \log\sqrt[3]{x} + 2\log\sqrt[6]{x^2} = ?$

1,8964

8. $\log(x^2) = 2,782$

$\Rightarrow \text{colog}(x^3) = ?$

$\overline{5},827$

9. $\log x + \text{colog}y = 8$

$\log x^2 - \text{colog}y = -5$

$\Rightarrow x \cdot y = ?$

10^{-6}

1. $5^x = 3$
$\Rightarrow x = ?$

A) 5 B) 3 C) $\log_5 3$ D) 1 E) $\log_3 5$

2. $3^{-x} = 4$
$\Rightarrow x = ?$

A) $\log_3 \frac{1}{4}$ B) $\log_3 4$ C) $\log_4 3$ D) $\log_4 \frac{1}{5}$ E) $\log_{\frac{1}{3}} 2$

3. $2^{x-2} = 3$
$\Rightarrow x = ?$

A) 1 B) $\log_2 12$ C) $\log_2 3$ D) $\log_2 \frac{3}{4}$ E) 4

4. $5^{x+1} = 2$
$\Rightarrow x = ?$

A) $\log_5 2$ B) $\log_5 \frac{2}{5}$ C) $\log_{\frac{5}{2}} 5$ D) $\log_2 5$ E) $\log_2 \frac{5}{2}$

5. $6^{1-x} = 2$
$\Rightarrow x = ?$

A) $\log_3 6$ B) $\log_{\frac{1}{6}} 3$ C) $\log_2 6$ D) $\log_2 3$ E) $\log_6 3$

6. $\log_2 x = 5$
$\Rightarrow x = ?$

A) $\frac{1}{32}$ B) $\frac{1}{16}$ C) 1 D) 16 E) 32

7. $\log_x 8 = 3$
$\Rightarrow x = ?$

A) -2 B) -1 C) 2 D) 4 E) 6

8. $\log_{\frac{1}{3}} x = 3$
$\Rightarrow x = ?$

A) 3 B) $\frac{1}{3}$ C) $\frac{1}{9}$ D) $\frac{1}{27}$ E) $\frac{1}{81}$

9. $\log_a 3 = 2$
$\Rightarrow a = ?$

A) $-\sqrt{3}$ B) $\sqrt{3}$ C) 1 D) 2 E) 3

10. $\log_a(0{,}25) = -2$
$\Rightarrow a = ?$

A) 4 B) 2 C) 1 D) $\frac{1}{2}$ E) $\frac{1}{4}$

11. $\log_{\sqrt{3}} x = 4, \quad \log_3 9 = y$
$\Rightarrow x \cdot y = ?$

A) 2 B) 3 C) 6 D) 9 E) 18

12. $\log_{\frac{1}{2}} 8 = x$
$\Rightarrow x = ?$

A) -6 B) -3 C) -2 D) 2 E) 3

13. $\log_5(x + 3) = 0$
$\Rightarrow x = ?$

A) -3 B) -2 C) -1 D) 1 E) 3

14. $\log_3(\log_2 x) = 1$
$\Rightarrow x = ?$

A) 1 B) 2 C) 4 D) 6 E) 8

15. $\log_5(\log_3(x-2)) = 0$
$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

16. $\log_5(2 + \log_3(2x + 1)) = 1$
$\Rightarrow x = ?$

A) 13 B) 10 C) 7 D) 5 E) 3

1. $f(x) = 5^x$
$\Rightarrow f^{-1}(x) = ?$

A) $\log_x 5$ B) $\log_{\frac{1}{5}} x$ C) $\log_2 x$ D) $\log_5 x$ E) $\left(\frac{1}{5}\right)^x$

2. $f(x) = 2^{x-1}$
$\Rightarrow f^{-1}(x) = ?$

A) $1 + \log_2 x$ B) $1 - \log_2 x$ C) $\log_2 x$ D) $\log_2(x - 1)$ E) $\log_2(x + 1)$

3. $f(x) = 3 \cdot 2^{x-5}$
$\Rightarrow f^{-1}(6) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

4. $f(x) = 5^{x-3} + 2$
$\Rightarrow f^{-1}(x) = ?$

A) $\log_5(x - 2)$ B) $3 - \log_5(x - 2)$ C) $1 - \log_5(x - 2)$ D) $3 + \log_5(x - 2)$ E) $\log_5(x + 1)$

5. $f(x) = \log_2 x$
$\Rightarrow f^{-1}(x) = ?$

A) 2^{-x} B) $(-2)^x$ C) $2x$ D) x^2 E) 2^x

6. $f(x) = \log_{\frac{1}{2}}(x + 3)$
$\Rightarrow f^{-1}(x) = ?$

A) $2^{-x} - 3$ B) 2^{-x} C) $2^{-x} + 3$ D) $2^{-x} + 1$ E) $2^{-x} - 1$

7. $f(x) = \log_3(x + 1)$
$\Rightarrow f^{-1}(2) = ?$

A) 1 B) 2 C) 8 D) 11 E) 26

8. $f(x) = 2 + \log_3(x + 5)$
$\Rightarrow f^{-1}(4) = ?$

A) 2 B) 4 C) 6 D) 8 E) 10

9. $f(x) = 5 \cdot \log_4(x+3) + 1$
$\Rightarrow f^{-1}(6) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

10. $\log\frac{1}{100} - \log 10 + \log 1000 = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

11. $\log(x+22) = 2$
$\Rightarrow x = ?$

A) 98 B) 88 C) 78 D) 38 E) 28

12. $\log(\log(x-3)) = 0$
$\Rightarrow x = ?$

A) 23 B) 13 C) 4 D) 3 E) 1

13. $\ln e^3 + 2 \cdot \ln\frac{1}{e} - \ln\frac{1}{e^2} = ?$

A) 3 B) 2 C) 1 D) –1 E) –2

14. $\ln(x-1) = 3$
$\Rightarrow x = ?$

A) e^3 B) $e^3 + 1$ C) $1 - e^3$ D) $e^3 - 1$ E) $3e - 1$

15. $\ln(2x+1) = 2$
$\Rightarrow x = ?$

A) $\frac{1}{2}(e^2 - 1)$ B) $\frac{1}{2}e^2$ C) $e^2 - 1$ D) $e^2 + 1$ E) $2e^2 - 2$

16. $\ln(\log_2(x-3)) = 0$
$\Rightarrow x = ?$

A) 5 B) e^2 C) $e + 3$ D) 10 E) 8

1. $\log_3(4x - 11) = 0$
$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

2. $\log(x^3 - 26) = 0$
$\Rightarrow x = ?$

A) –3 B) 0 C) 1 D) 3 E) 6

3. $\log_3 3 + \log 100 - \log_{\sqrt{2}} \sqrt{2} + \ln e = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

4. $\log_2 x = 1$
$\Rightarrow \log_x 8 + \log_x 1 = ?$

A) –1 B) 0 C) 1 D) 3 E) 4

5. $\log_3 x = \frac{1}{2}$
$\Rightarrow 2 \cdot \log_{\sqrt{3}} x + 2 \cdot \log_x 3 = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

6. $\log_{(x-3)}(2\sqrt{x}) = 1$
$\Rightarrow x = ?$

A) 1 B) 4 C) 5 D) 6 E) 9

7. $\log_{(2x-1)}(x + 7) = 1$
$\Rightarrow x = ?$

A) 5 B) 6 C) 7 D) 8 E) 9

8. $\log_{(x^2)}(8x - 16) = 1$
$\Rightarrow x = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

9. $\log 2 + \log 5 + \log \frac{1}{100} = ?$

A) 3 B) 2 C) $\frac{3}{2}$ D) 1 E) –1

10. $\log_5 100 + \log_5 2 + \log_5 \frac{1}{8} = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

11. $\log_2 \frac{2}{3} + \log_2 \frac{3}{4} + \ldots\ldots\ldots + \log_2 \frac{31}{32} = ?$

A) – 4 B) – 2 C) 1 D) $\frac{3}{2}$ E) 4

12. $\log 2 = x \quad \log 3 = y$

$\Rightarrow \log 6 = ?$

A) $x \cdot y$ B) $x + y$ C) $x - y$ D) $\frac{x}{y}$ E) $x + y + 1$

13. $\log 650 = x \quad \log 5 = y \quad \log 2 = z$

$\Rightarrow \log 13 = ?$

A) $x - 2y - 2z$ B) $x - y - z$ C) $x - 2y$ D) $x - 2y - z$ E) $x - 2y + z$

14. $\log_8(x + 2) + \log_8 2 = 1$

$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 8

15. $e^{\ln 9} + 2^{\log_2 3} = ?$

A) 3 B) 6 C) 8 D) 9 E) 12

16. $\log(x + y) = \log(3x) + \log(2y)$

$\Rightarrow x = ?$

A) $\frac{y}{6y - 1}$ B) $\frac{1}{6y - 1}$ C) $\frac{6y - 1}{y}$ D) $\frac{1}{y - 1}$ E) $\frac{y}{y - 1}$

1. $\log_2 8 - \log_2 4 = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

2. $\log(\ln e) + \ln(\log_2 2) + 3 \cdot \ln\frac{1}{e} = ?$

A) –3 B) –2 C) –1 D) 0 E) 3

3. $8^{\log_2 3} = ?$

A) 6 B) 8 C) 9 D) 27 E) 81

4. $\log(3x - 4) - \log(x + 6) = 0$
$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

5. $\log_3(4x + 3) - \log_3(2x - 11) = 0$
$\Rightarrow$ S.S. = ?

A) {–7} B) {–3} C) ∅ D) {7} E) {8}

6. $\ln(x + 2y) = \ln x - \ln y$
$\Rightarrow x = ?$

A) $\frac{y^2}{1-y}$ B) $\frac{2y^2}{1-y}$ C) $\frac{1}{1-y}$ D) $\frac{y^2}{y-1}$ E) $\frac{2y^2}{y-1}$

7. $\log\left(\frac{x}{y}\right) + \log(x \cdot y) = 6$
$\Rightarrow x = ?$

A) 1 B) $\sqrt{10}$ C) 10 D) 100 E) 1000

8. $\log(x \cdot y) = a$
$\log\left(\frac{x}{y}\right) = b$
$\Rightarrow \log x = ?$

A) $a + b$ B) $a - b$ C) $\frac{a+b}{2}$ D) $\frac{a-b}{2}$ E) $a \cdot b$

9. $\ln 2 = x$
$\ln 3 = y$
$\ln 5 = z$
$\Rightarrow \ln\left(\frac{18}{20}\right) = ?$

A) $2y - x - z$ B) $2y + x + z$ C) $2x + 2y$ D) $2z - x - y$ E) $x + y + z$

10. $\log 2 = x$
$\Rightarrow \log 5 = ?$

A) $-x$ B) $1 - x$ C) $1 + x$ D) $2 - x$ E) $2 - 2x$

11. $\log_2 32 + \log_6 36 - \log_7 343 = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

12. $\log_{27} 81 + \log_{\sqrt{2}} 8 + \log_{64} 16 = ?$

A) 4 B) 6 C) 7 D) 8 E) 9

13. $\log_{16} 8 + \log_5 125 - \log_{\frac{1}{5}} 25 + \log_{\frac{1}{16}} 4 = ?$

A) $\frac{1}{4}$ B) 2 C) $\frac{19}{4}$ D) $\frac{21}{5}$ E) $\frac{21}{4}$

14. $\log_3(\log_2 8) = ?$

A) 4 B) 3 C) 2 D) 1 E) 0

15. $\log_2(\log_5 25) = \log_7(x + 1)$
$\Rightarrow x = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

16. $\log_5(125!) = a$
$\Rightarrow \log_5(124!) = ?$

A) $a + 4$ B) $a + 3$ C) $a + 2$ D) $a - 3$ E) $3a$

1. $\log_{\sqrt{3}} x + \log_3 x + \log_{27} x = \frac{20}{3}$
$\Rightarrow x = ?$

A) 0 B) 1 C) 3 D) 9 E) 27

2. $\log_2 x \cdot \log_4 x \cdot \log_{16} x = 64$
$\Rightarrow x = ?$

A) 8 B) 9 C) 2^6 D) 2^7 E) 2^8

3. $3 \cdot \log_5 2 = \log_{25} x$
$\Rightarrow x = ?$

A) 2 B) 4 C) 16 D) 64 E) 128

4. $\log(x^3 \cdot y^2) = a \qquad \log\left(\frac{x}{y}\right) = b$
$\Rightarrow \log x = ?$

A) $a - 2b$ B) $\frac{a-2b}{5}$ C) $\frac{a-2b}{3}$ D) $a + 2b$ E) $\frac{a+2b}{5}$

5. $\log_5 3 \cdot \log_3 2 \cdot \log_2 25 = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

6. $\frac{1}{\log_5 1235} + \frac{1}{\log_{13} 1235} + \frac{1}{\log_{19} 1235} = ?$

A) 19 B) 13 C) 11 D) 5 E) 1

7. $\frac{3}{\log_b(a^2 b)} + \frac{6}{\log_a(a^2 b)} = \log_5 x$
$\Rightarrow x = ?$

A) ab B) b^2 C) 5 D) 25 E) 125

8. $\log_2 3 = x$
$\Rightarrow \log_3 32 = ?$

A) $\frac{5}{x}$ B) $\frac{3}{x}$ C) $\frac{1}{x}$ D) 3x E) 5x

9. $\log_5 3 = x$
$\Rightarrow \log_3 15 = ?$

A) $\frac{x+1}{x}$ B) $\frac{x}{x+1}$ C) $\frac{x-1}{x}$ D) $\frac{x}{x-1}$ E) $\frac{1-x}{x}$

10. $\log_3 2 = a$ $\log_3 5 = b$
$\Rightarrow \log_{12} 150 = ?$

A) $\frac{2b+a+1}{2a+1}$ B) $\frac{a+b}{a+1}$ C) $a+b+1$ D) $\frac{2a+b+1}{2b}$ E) $\frac{2b+1}{4a}$

11. $2^{\log_2 25} - 3^{\log_{27} 64} + e^{\ln 5} = ?$

A) 22 B) 24 C) 26 D) 30 E) 32

12. $9^{\log_3 2} = ?$

A) $\sqrt{2}$ B) 2 C) 3 D) 4 E) 8

13. $11^{\log_{11}[\log_4(2x-8)]} = 1$
$\Rightarrow x = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

14. $e^{2+\ln(3x-2)} = \frac{5e^2}{2}$
$\Rightarrow x = ?$

A) $\frac{3}{4}$ B) $\frac{3}{2}$ C) 1 D) $\frac{2}{3}$ E) $\frac{4}{3}$

15. $3^{\log x} + x^{\log 3} = 18$
$\Rightarrow x = ?$

A) 1000 B) 500 C) 100 D) 10 E) 3

16. $3^{\ln x} + 2 \cdot x^{\ln 3} - 9 = 0$
$\Rightarrow x = ?$

A) 0 B) 1 C) e D) $\sqrt{e}$ E) $\frac{1}{e}$

1. $\log x = 0{,}301$

$\Rightarrow \log(x^3) = ?$

A) 3,301 B) 2,301 C) 1,602 D) 0,903 E) 0,602

2. $\log x = 1{,}041$

$\Rightarrow \log(100 \cdot x^2) = ?$

A) 2,082 B) 2,841 C) 4,041 D) 4,082 E) 4,82

3. $\log 2 \cong 0{,}301$

$\Rightarrow \log 16 + \log 640 = ?$

A) 4,01 B) 4,001 C) 4,201 D) 4,301 E) 4,331

4. $\log 5 \cong 0{,}698$

$\Rightarrow \log \frac{2}{500} = ?$

A) –1,396 B) –2,396 C) –2, 604 D) –3,604 E) –3, 698

5. $\log x \cong 0{,}47$

$\Rightarrow \log(x^{-1}) + \log(0{,}01 \cdot \sqrt{x}) = ?$

A) $\bar{2},765$ B) $\bar{2},235$ C) $\bar{1},235$ D) $\bar{3},765$ E) $\bar{3},235$

6. $\log 3 \cong 0{,}477$ $\log 5 \cong 0{,}698$

$\Rightarrow \log\left(\frac{15}{2}\right) = ?$

A) 1,396 B) 0,873 C) –1,873 D) –1,396 E) –0,873

7. $\log x = \bar{3},602$ $\log y = 2{,}699$

$\Rightarrow \log\left(\frac{x}{y}\right) = ?$

A) 6,097 B) $\bar{3},903$ C) $\bar{5},903$ D) – 6,903 E) $\bar{6},903$

8. $\log(a^2) = -0{,}602$

$\Rightarrow \log a = ?$

A) 0,31 B) 0,301 C) $\bar{1},699$ D) $\bar{2},602$ E) 0,602

9. $\log 3 \cong 0{,}4771$
$\Rightarrow \log(0{,}3) - \log(0{,}09) = ?$

A) 1,5229 B) $\bar{1},5229$ C) 0,5229
D) $\bar{2},9442$ E) $\bar{1},9442$

10. $\log 5 \cong 0{,}698$
$\Rightarrow \log(0{,}25) + \log(0{,}125) = ?$

A) $\bar{3},51$ B) 3,49 C) $\bar{1},49$
D) 2,51 E) $\bar{2},49$

11. $\log x = \bar{1},340$
$\Rightarrow \log(x^2) = ?$

A) 0,34 B) $\bar{1},34$ C) $\bar{2},68$
D) 1,92 E) $\bar{1},98$

12. $\log x = 2{,}456$
$\Rightarrow -\log x = ?$

A) 3,456 B) $\bar{2},456$ C) $\bar{3},544$
D) $\bar{3},456$ E) $\bar{2},544$

13. $-\log x = 1{,}123$
$\Rightarrow \log(x^2) = ?$

A) $\bar{2},246$ B) $\bar{3},754$ C) $\bar{3},246$
D) $\bar{1},246$ E) 2,754

14. $\log x = 2{,}246$
$\Rightarrow -\log(x^3) = ?$

A) $\bar{7},262$ B) $\bar{6},738$ C) $\bar{7},246$
D) $\bar{6},262$ E) $\bar{7},738$

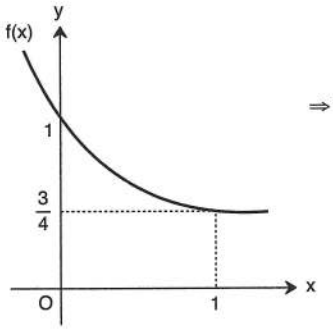
15. $\log\sqrt{x} = 1{,}205$
$\Rightarrow \log\left(\frac{1}{x}\right) = ?$

A) 2,41 B) 1,41 C) $\bar{3},59$
D) $\bar{2},41$ E) $\bar{1},59$

16. $-\log(x^2) = 4{,}354$
$\Rightarrow \log\left(\frac{1}{x^3}\right) = ?$

A) 5,531 B) 6,177 C) $\bar{2},177$
D) 6,531 E) $\bar{6},531$

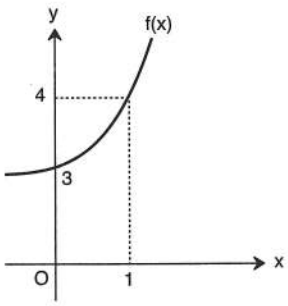
1.



$\Rightarrow f(x) = ?$

A) $f(x) = 4^x$
B) $f(x) = 3^x$
C) $f(x) = \log_3 x$
D) $f(x) = \log_{\frac{1}{4}} x$
E) $f(x) = \left(\frac{3}{4}\right)^x$

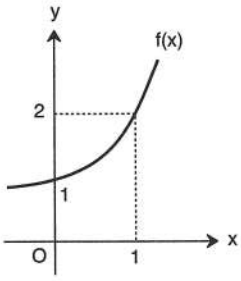
2.



$\Rightarrow f(x) = ?$

A) $f(x) = 2^{x+1}$
B) $f(x) = 3^{x+1}$
C) $f(x) = 2^x + 2$
D) $f(x) = \left(\frac{1}{3}\right)^x + 1$
E) $f(x) = \left(\frac{1}{2}\right)^x + 2$

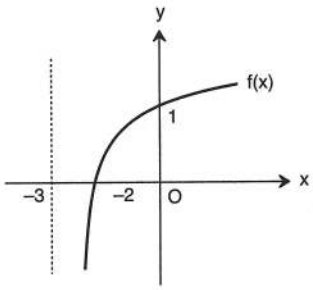
3.



$\Rightarrow f(x) = ?$

A) $f(x) = 2^x$
B) $f(x) = \log_2 x$
C) $f(x) = \log_{\frac{1}{2}} x$
D) $f(x) = x^2$
E) $f(x) = \log_x 2$

4.

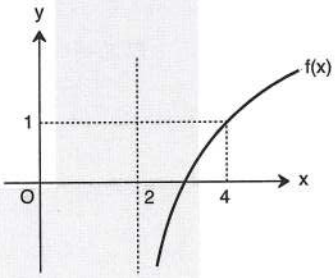


$f(x) = \log_a(x + 3)$

$\Rightarrow f(6) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

5.

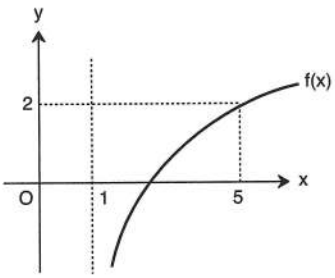


$f(x) = \log_a(x - 2)$

$\Rightarrow f(10) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

6.

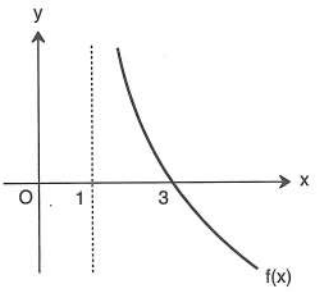


$f(x) = \log_a(x - 1)$

$\Rightarrow f(17) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

7.

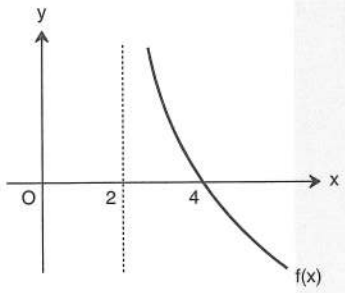


$f(x) = 1 - \log_a(x - 1)$

$\Rightarrow f(9) = ?$

A) –6 B) –5 C) –4 D) –3 E) –2

8.

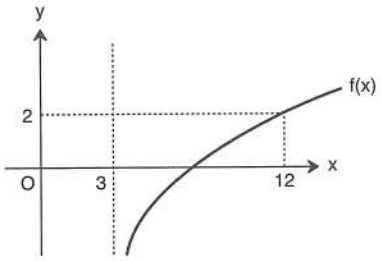


$f(x) = a - \log_2(x - 2)$

$\Rightarrow f(18) = ?$

A) –5 B) –4 C) –3 D) –2 E) –1

9.

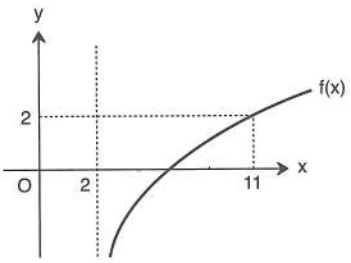


$f(x) = \log_a(x - b)$

$\Rightarrow a \cdot b = ?$

A) 2 B) 3 C) 6 D) 9 E) 12

10.

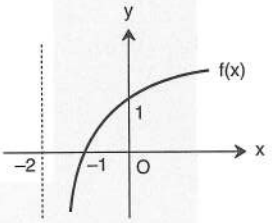


$f(x) = \log_a(x + b)$

$\Rightarrow a + b = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

11.

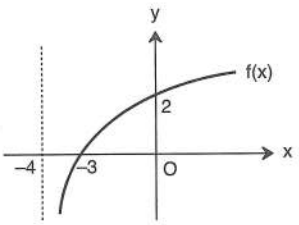


$f(x) = \log_a(x + b)$

$\Rightarrow a + b = ?$

A) 2 B) 3 C) 4 D) 6 E) 8

12.



$f(x) = \log_a(x + b)$

$\Rightarrow a \cdot b = ?$

A) 2 B) 3 C) 4 D) 6 E) 8

1. $27^x = 9 \quad 3^y = 9$
$\Rightarrow x \cdot y = ?$

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $\frac{3}{4}$ D) 1 E) $\frac{4}{3}$

2. $5^x = 3$
$\Rightarrow 5^{3x+1} = ?$

A) 27 B) 125 C) 135 D) 81 E) 5

3. $2^x = a \quad 3^x = b \quad 5^x = c$
$\Rightarrow 600^x = ?$

A) abc B) a^2b C) a^3bc^2 D) a^2bc E) $a^2b^2c^2$

4. $3^{2x-6} = 81$
$\Rightarrow x = ?$

A) – 4 B) – 1 C) 0 D) 4 E) 5

5. $e^{x-2} = 1$
$\Rightarrow x = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

6. $3^{(x-4)(x+3)} = 1$
$\Rightarrow$ S.S. = ?

A) {4} B) {–3, 4} C) {–3} D) {0, 1} E) {1}

7. $3^{x+1} + 3^{x-2} - 3^{x+2} = -53$
$\Rightarrow x = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

8. $3^x \cdot 2^{x+1} = 72$
$\Rightarrow x = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

9. $5 \cdot 9^x = 27^x$

$\Rightarrow x = ?$

A) $\log_5 3$ B) $\log_9 5$ C) $\log_5 9$ D) $\log_3 5$ E) 5

10. $2 \cdot \log_4(3x) = 1 + 2 \cdot \log_4(x + 1)$

$\Rightarrow x = ?$

A) 3 B) $\frac{5}{2}$ C) 2 D) 1 E) 0

11. $2^{\ln x} + 2^{1 - \ln x} = 3$

$\Rightarrow$ S.S. = ?

A) $\{e\}$ B) $\{1\}$ C) $\{1, e\}$ D) $\{1, e^2\}$ E) $\{1, 0\}$

12. $\log_3 x + \log_x 9 = 3$

S.S. = $\{x_1, x_2\}$

$\Rightarrow x_1 + x_2 = ?$

A) 3 B) 6 C) 12 D) 15 E) 30

13. $9^{\log_{27}(x^3)} = x + 12$

$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 12

14. $x^{(2 - \log_3 x)} = 3$

$\Rightarrow x = ?$

A) 3 B) 2 C) 1 D) $\frac{1}{2}$ E) $\frac{1}{3}$

15. $(x + 2)^{\log_4(x+2)} = 256$

$\Rightarrow x = ?$

A) 2 B) 8 C) 14 D) 16 E) 24

16. $x^{\ln x} = e^5 \cdot x^4$

S.S. = $\{x_1, x_2\}$

$\Rightarrow x_1 \cdot x_2 = ?$

A) e^4 B) e^2 C) e D) $\frac{1}{e^2}$ E) $\frac{1}{e^4}$

1. $\log_3(x-2) > 1$
$\Rightarrow$ S.S. = ?

A) $(5, \infty)$ B) $(3, \infty)$ C) $(-\infty, 5)$ D) $(3, 5)$ E) $(2, \infty)$

2. $\log_5(7-x) < 2$
$\Rightarrow$ S.S. = ?

A) $(-\infty, 7)$ B) $(-18, \infty)$ C) $(7, \infty)$ D) $(-18, 7)$ E) $(-\infty, -18)$

3. $\log_{\frac{1}{2}}(x-3) > 1$
$\Rightarrow$ S.S. = ?

A) $(-\infty, 3)$ B) $(3, \infty)$ C) $\left(\frac{7}{2}, \infty\right)$ D) $\left(3, \frac{7}{2}\right)$ E) $\left(-\infty, \frac{7}{2}\right)$

4. $\log_{\frac{1}{3}}(x+2) \leq 1$
$\Rightarrow$ S.S. = ?

A) $\left(-2, -\frac{5}{3}\right]$ B) $\left[-\frac{5}{3}, \infty\right)$ C) $\left(-\infty, -\frac{5}{3}\right]$ D) $(-2, \infty)$ E) $\left[-2, -\frac{5}{3}\right)$

5. $1 < \log_2(x-3) \leq 3$
$\Rightarrow$ S.S. = ?

A) $(-\infty, 11)$ B) $(2, \infty)$ C) $(5, 11]$ D) $(-\infty, 2) \cup (11, \infty)$ E) $(2, 3)$

6. $1 \leq \log_3(x+4) \leq 3$
$\Rightarrow$ S.S. = ?

A) $[-4, \infty)$ B) $[-1, \infty)$ C) $(-\infty, 23]$ D) $[-1, 23]$ E) $[-4, 23]$

7. $|\log(x+1)| < 1$
$\Rightarrow$ S.S. = ?

A) $(-\infty, 9)$ B) $(-0.9, 9)$ C) $(-0.9, \infty)$ D) $(9, \infty)$ E) $(-1, \infty)$

8. $|\log_3(x-2)| \leq 2$
$\Rightarrow$ S.S. = ?

A) $\left[\frac{17}{9}, \infty\right)$ B) $(-\infty, 3]$ C) $(-\infty, 11)$ D) $\left[\frac{19}{9}, 11\right]$ E) $[2, 11]$

9. $\log_8(x-1) + \log_8(x+1) \leq 1$
$\Rightarrow$ S.S. = ?

A) $(1, \infty)$ B) $(-\infty, 3)$ C) $[-3, 1)$
D) $(1, 3]$ E) $(3, \infty)$

10. $\log_5(x-4) + \log_5(x) < 1$
$\Rightarrow$ S.S. = ?

A) $(4, 5)$ B) $(-\infty, -1)$ C) $(-\infty, 5)$
D) $(5, \infty)$ E) $(-1, 5)$

11. $\log_4\left(\dfrac{2x+2}{x-2}\right) < 1$
$\Rightarrow$ S.S. = ?

A) $(2, 5)$ B) $(-\infty, -1) \cup (2, 4)$
C) $[5, \infty)$ D) $(-\infty, -1) \cup (5, \infty)$
E) $(-\infty, 2)$

12. $\log_2(\log_3(x+1)) \leq 1$
$\Rightarrow$ S.S. = ?

A) $(8, \infty)$ B) $(0, 8]$ C) $(-1, 8]$
D) $(-\infty, 6]$ E) $(-\infty, 4]$

13. $\log_3(\log_3(x-2)) < 1$
$\Rightarrow$ S.S. = ?

A) $(-\infty, 29)$ B) $(-\infty, 27]$ C) $(2, \infty)$
D) $(2, 29)$ E) $(3, 29)$

14. $\log_{\frac{1}{2}}[\log_3(x-1)] > -1$
$\Rightarrow$ S.S. = ?

A) $(2, 10)$ B) $(10, \infty)$ C) $(1, 10)$
D) $(1, 8)$ E) $[1, 9]$

15. $\dfrac{\log(4x-2)}{\log(x^2+4)} \leq 0$
$\Rightarrow$ S.S. = ?

A) $(-2, 4)$ B) $[-2, 4]$ C) $(-\infty, 4]$
D) $\left[\frac{1}{4}, \frac{3}{4}\right)$ E) $\left(\frac{1}{2}, \frac{3}{4}\right]$

16. $a = \log_{\frac{1}{5}}\frac{4}{3}$ $b = \log_{\frac{1}{2}}9$ $c = \log_3\frac{1}{5}$
$\Rightarrow ? < ? < ?$

A) $a < b < c$ B) $b < c < a$ C) $c < b < a$
D) $b < a < c$ E) $c < a < b$

1. $\log_2 3 \cdot \log_3 13 \cdot \log_{13} 16 = ?$

A) 4 B) 3 C) 2 D) 1 E) $\frac{1}{3}$

2. $\log_3 27 + \log_{\frac{1}{3}} 9 + \log_3 \frac{1}{81} - \log_9 81 = ?$

A) –7 B) – 6 C) – 5 D) – 4 E) – 2

3. $\log(x + y) = \log x + \log y$

$\Rightarrow x = ?$

A) $\frac{y}{y-1}$ B) $\frac{y-1}{y}$ C) $\frac{y-1}{y^2}$ D) $\frac{y^2}{y-1}$ E) $\frac{y^2+1}{y}$

4. $\log 2 = a$

$\Rightarrow \log 20 = ?$

A) 4a B) 2 + a C) 1 + a D) 1 – a E) 2 – a

5. $\log_{\sqrt{3}} 2 \cdot \log_{\sqrt{2}} 7 = x$

$\Rightarrow \log_3 49 = ?$

A) $\frac{x}{8}$ B) $\frac{x}{4}$ C) $\frac{x}{2}$ D) x E) 2x

6. $\log_5 x + \log_{25} x + \log_{125} x = \frac{11}{2}$

$\Rightarrow x = ?$

A) 5 B) 20 C) 25 D) 125 E) 625

7. $\log 2 \cong 0{,}301$

$\Rightarrow \log 40 = ?$

A) 2,602 B) 1,301 C) 1,2309 D) 2,903 E) 1,602

8. $\sqrt{(4\log 2)^2 + \left(\log\left(\frac{1}{8}\right)\right)^2} = ?$

A) $\sqrt{2}\log 2$ B) $\sqrt{3}\log 2$ C) $2 \cdot \log 2$ D) 2 E) $5 \cdot \log 2$

9. $\log_2 3 \cdot \log_9(3x-2) = 1$
$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

10. $\log(3x-2) - \log(3x+3) = 0$
$\Rightarrow$ S.S. = ?

A) $\left\{\frac{3}{2}\right\}$ B) $\left\{-\frac{2}{3}\right\}$ C) $R \setminus \{1\}$ D) R E) $\varnothing$

11. $\log_2 30 = x$ $\log_y 30 = 3$ $\log_{22} z = \frac{1}{3}$
$\Rightarrow ? < ? < ?$

A) $x < y < z$ B) $z < x < y$ C) $y < x < z$ D) $z < y < x$ E) $y < z < x$

12. $\log a = \overline{2},345$
$\Rightarrow \log\sqrt{a} = ?$

A) $\overline{1},1725$ B) 0,8275 C) $\overline{1},8275$ D) $\overline{2},8275$ E) $\overline{2},1725$

13. $f(x) = 2 - \ln x$
$g(x) = x^2 - a$
$(gof)(e) = 2$
$\Rightarrow a = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

14. $f(x) = \log_2 x$
$(gof)(x) = x + 3$
$\Rightarrow g(x) = ?$

A) $2^x + 3$ B) $2^x + 2$ C) $\log_2(x+3)$ D) 2^x E) 2^{x+3}

15. $\log_{\frac{3}{4}}(x-2) \geq 1$
$\Rightarrow$ S.S. = ?

A) $\left(0, \frac{11}{4}\right)$ B) $\left(1, \frac{11}{3}\right]$ C) $\left(2, \frac{11}{4}\right]$ D) $\left[\frac{3}{11}, 1\right)$ E) $[2, \infty)$

16. $\log_3\left[3 - \log_2\left(\frac{x}{3}\right)\right] = 1$
$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

LOGARİTMA
LOGARITHM

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	A	B	B	E	E	C	D	B	B	E	B	B	E	E	A

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	E	D	E	A	C	B	A	A	C	B	A	B	A	A

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	C	D	E	E	D	C	E	C	A	B	D	B	E	A

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	A	D	E	C	B	E	C	A	B	D	D	E	D	E	D

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	E	D	E	B	E	E	A	A	A	C	D	E	B	C	C

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	A	B	D	B	E	C	C	E	C	C	B	A	C	D

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	C	A	B	C	D	E	C	D	A	C	E				

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	C	C	E	E	B	A	C	D	C	C	C	D	A	C	A

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	D	D	B	C	D	B	D	D	A	D	B	E	A	E	B

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	C	A	C	C	D	E	E	B	E	D	A	B	A	C	C

TOPLAM ÇARPIM SEMBOLÜ

SUMMATION AND PRODUCT NOTATION

TOPLAM ÇARPIM SEMBOLÜ

ÖZELLİK | Property 1

- $1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}$
- $2 + 4 + 6 + ... + 2n = n(n+1)$
- $1 + 3 + 5 + ... + (2n-1) = n^2$
- $1^2 + 2^2 + 3^2 + ... + n^2 = \frac{n(n+1)(2n+1)}{6}$
- $1^3 + 2^3 + 3^3 + ... + n^3 = \left[\frac{n(n+1)}{2}\right]^2$
- $1 \cdot 2 + 2 \cdot 3 + ... + n(n+1) = \frac{n \cdot (n+1) \cdot (n+2)}{3}$
- $1 \cdot 1! + 2 \cdot 2! + 3 \cdot 3! + ... + n(n!) = (n+1)! - 1$
- $1 + r + r^2 + r^3 + ... + r^n = \frac{r^{n+1} - 1}{r - 1} = \frac{1 - r^{n+1}}{1 - r}$

1. $1 + 2 + 3 + ... + 30 = ?$ — 465

2. $2 + 4 + 6 + ... + 50 = ?$ — 650

3. $1 + 3 + 5 + ... + 39 = ?$ — 400

4. $1^2 + 2^2 + 3^2 + ... + 10^2 = ?$ — 385

5. $1^3 + 2^3 + 3^3 + 4^3 + ... + 19^3 = ?$ — 36100

6. $1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + ... + 20 \cdot 21 = ?$ — 3080

7. $1 \cdot 1! + 2 \cdot 2! + 3 \cdot 3! + ... + 27 \cdot 27! = ?$ — $(28)! - 1$

8. $1 + 2 + 2^2 + 2^3 + ... + 2^{10} = ?$ — $2^{11} - 1$

9. $5 + 6 + 7 + 8 + ... + 40 = ?$ — 810

10. $4^2 + 5^2 + 6^2 + ... + 20^2 = ?$ — 2856

11. $3^3 + 4^3 + 5^3 + ... + 20^3 = ?$ — 44091

12. $1 + 3 + 3^2 + 3^3 + ... + 3^{20} = ?$ — $\frac{3^{21} - 1}{2}$

ÖZELLİK | Property 2

Toplam Sembolü | Summation Notation

$\sum \longrightarrow$ sigma (toplam sembolü) *(summation notation)*

$n, r \in Z$

$$\sum_{k=r}^{n} f(k) = f(r) + f(r+1) + f(r+2) + \ldots\ldots + f(n)$$

$k \in \{r, (r+1), (r+2), \ldots\ldots, n\}$

- $\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$
- $\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$
- $\sum_{k=1}^{n} k^3 = \left[\frac{n(n+1)}{2}\right]^2$

1. $\sum_{k=3}^{5} (k^2) = ?$ — 50
2. $\sum_{k=2}^{6} (2k) = ?$ — 40
3. $\sum_{k=1}^{5} 7 = ?$ — 35
4. $\sum_{k=1}^{10} k = ?$ — 55
5. $\sum_{k=1}^{7} k^2 = ?$ — 140

ÖZELLİK | Property 3

- $\sum_{k=1}^{n} a = \underbrace{a + a + a + \ldots\ldots + a}_{n \text{ tane } (n \text{ times})} = a \cdot n$
- $\sum_{k=r}^{n} a = \underbrace{a + a + a + \ldots\ldots + a}_{n-r+1 \text{ tane } (n \text{ times})} = a(n-r+1)$

1. $\sum_{k=1}^{10} 7 = ?$ — 70
2. $\sum_{k=1}^{20} (-3) = ?$ — -60
3. $\sum_{k=1}^{15} 2 = ?$ — 30
4. $\sum_{k=10}^{20} 3 = ?$ — 33
5. $\sum_{k=7}^{23} 5 = ?$ — 85
6. $\sum_{k=-8}^{10} 4 = ?$ — 76

TOPLAM ÇARPIM SEMBOLÜ

ÖZELLİK | Property 4

$m \in R$

$$\sum_{k=r}^{n} m \cdot f(k) = m \sum_{k=r}^{n} f(k)$$

1. $\sum_{k=1}^{10} (3k) = ?$ — 165
2. $\sum_{k=1}^{20} (2k^2) = ?$ — 5740
3. $\sum_{k=1}^{10} (5k^3) = ?$ — 15125
4. $\sum_{k=0}^{5} (2 \cdot 2^k) = ?$ — 126
5. $\sum_{k=1}^{10} (5 \cdot a) = ?$ — 50a
6. $\sum_{k=1}^{8} (2k^2) = ?$ — 408
7. $\sum_{k=2}^{7} (3k^3) = ?$ — 2349

ÖZELLİK | Property 5

$$\sum_{k=r}^{n} (f(k) \mp g(k)) = \sum_{k=r}^{n} f(k) \mp \sum_{k=r}^{n} g(k)$$

1. $\sum_{k=1}^{10} (k^2 - k) = ?$ — 330
2. $\sum_{k=1}^{9} (k + 3) = ?$ — 72
3. $\sum_{k=1}^{12} (k^3 - 1) = ?$ — 6072
4. $\sum_{k=1}^{13} (3k - 2) = ?$ — 247
5. $\sum_{k=1}^{20} (2k + 7) = ?$ — 560
6. $\sum_{k=1}^{13} (4k - 5) = ?$ — 299
7. $\sum_{k=1}^{10} (2k^2 - k) = ?$ — 715

ÖZELLİK | Property 6

a) $\sum_{k=r}^{n} f(k) = \sum_{k=r-a}^{n-a} f(k+a)$

b) $\sum_{k=r}^{n} f(k) = \sum_{k=r+a}^{n+a} f(k-a)$

c) $\sum_{k=r}^{n} f(k) = \sum_{k=1}^{n} f(k) - \sum_{k=1}^{r-1} f(k)$

Toplam kurallarının tamamı "1" den başladığından; indisin 1'den başlamadığı durumlarda a veya b kuralları uygulanarak indisler 1'den başlatılır. İndis değiştirmek yerine c kuralı uygulanarak eksik terimler çıkarılır.

Not: Fonksiyon 1. dereceden denklem ise a ve b kuralları uygulanır. Fonksiyon 2. veya 3. dereceden denklem ise c kuralı uygulanır.

All the addition rules start from '1' but in some cases where the index does not start from '1', a and b rules are applied to make the index start from '1'. Missing terms are found by appliying c rule instead of changing the index.

Note: If the function is a simple equation a and b rules are applied. If the function is a quadratic or a cubic equation then c rule is applied.

1. $\sum_{k=5}^{24} (2k-1) = ?$ 560

2. $\sum_{k=11}^{30} (3k+2) = ?$ 1270

3. $\sum_{k=-3}^{15} (4k+1) = ?$ 475

4. $\sum_{k=-5}^{10} (3k-10) = ?$ -40

5. $\sum_{k=7}^{30} (5k+8) = ?$ 2412

6. $\sum_{k=4}^{17} (2k+5) = ?$ 364

7. $\sum_{k=5}^{13} k^2 = ?$ 789

8. $\sum_{k=6}^{14} k^3 = ?$ 10800

9. $\sum_{k=10}^{20} 2^k = ?$ $2^{21} - 2^{10}$

10. $\sum_{k=8}^{23} (k \cdot k!) = ?$ $24! - 8!$

TOPLAM ÇARPIM SEMBOLÜ

ÖZELLİK | Property 7

Çarpım Sembolü | Product Notation

$\prod \longrightarrow$ pi (çarpım sembolü) *(product notation)*

$n, r \in Z$

$$\prod_{k=r}^{n} f(k) = f(r) \cdot f(r+1) \cdot f(r+2) \cdot \ldots\ldots \cdot f(n)$$

$k \in \{r, (r+1), (r+2), \ldots\ldots, n\}$

1. $\prod_{k=3}^{5} (2k) = ?$ — 480

2. $\prod_{k=2}^{4} 3 = ?$ — 27

3. $\prod_{k=4}^{6} k = ?$ — 120

4. $\prod_{k=1}^{10} (-1) = ?$ — 1

5. $\prod_{k=1}^{4} k^2 = ?$ — 576

6. $\prod_{k=3}^{5} (k+2) = ?$ — 210

7. $\prod_{k=-2}^{-1} k^4 = ?$ — 16

ÖZELLİK | Property 8

- $\prod_{k=1}^{n} k = 1 \cdot 2 \cdot 3 \cdot \ldots\ldots \cdot n = n!$
- $\prod_{k=r}^{n} k = r \cdot (r+1) \cdot \ldots\ldots \cdot n = \dfrac{n!}{(r-1)!}$

1. $\prod_{k=1}^{10} k = ?$ — $10!$

2. $\prod_{k=2}^{20} k = ?$ — $20!$

3. $\prod_{k=7}^{30} k = ?$ — $\dfrac{30!}{6!}$

4. $\prod_{k=10}^{25} k = ?$ — $\dfrac{25!}{9!}$

5. $\prod_{k=7}^{13} k = ?$ — $\dfrac{13!}{6!}$

6. $\prod_{k=-3}^{7} k = ?$ — 0

ÖZELLİK | Property 9

- $\prod_{k=1}^{n} c = \underbrace{c \cdot c \cdot c \cdot \ldots\ldots \cdot c}_{\text{n tane } (n \text{ times})} = c^n \ (c \in R)$

- $\prod_{k=r}^{n} c = \underbrace{c \cdot c \cdot c \cdot \ldots\ldots \cdot c}_{\text{n − r + 1 tane } (n-r+1 \text{ times})} = c^{n-r+1}$

1. $\prod_{k=1}^{10} 2 = ?$ $\boxed{2^{10}}$

2. $\prod_{k=2}^{17} 3 = ?$ $\boxed{3^{16}}$

3. $\prod_{k=0}^{20} 7 = ?$ $\boxed{7^{21}}$

4. $\prod_{k=10}^{32} 2 = ?$ $\boxed{2^{23}}$

5. $\prod_{k=6}^{27} 5 = ?$ $\boxed{5^{22}}$

6. $\prod_{k=9}^{18} 1 = ?$ $\boxed{1}$

7. $\prod_{k=15}^{41} (-1) = ?$ $\boxed{-1}$

ÖZELLİK | Property 10

- $\prod_{k=r}^{n} f(k) \cdot g(k) = \prod_{k=r}^{n} f(k) \cdot \prod_{k=r}^{n} g(k)$

- $\prod_{k=r}^{n} \frac{f(k)}{g(k)} = \frac{\prod_{k=1}^{n} f(k)}{\prod_{k=1}^{r-1} g(k)} \qquad g(k) \neq 0$

- $\prod_{k=1}^{n} c \cdot f(k) = c^n \cdot \prod_{k=1}^{n} f(k) \qquad (c \in R)$

- $\prod_{k=r}^{n} c \cdot f(k) = c^{n-r+1} \cdot \prod_{k=r}^{n} f(k) \qquad (c \in R)$

1. $\prod_{k=1}^{10} (k^2 + k) = ?$ $\boxed{10! \cdot 11!}$

2. $\prod_{k=1}^{10} (2k) = ?$ $\boxed{2^{10} \cdot 10!}$

3. $\prod_{k=3}^{12} (3k) = ?$ $\boxed{3^{10} \cdot \frac{12!}{2!}}$

4. $\prod_{k=1}^{20} \left(\frac{k+2}{k+1}\right) = ?$ $\boxed{11}$

TOPLAM ÇARPIM SEMBOLÜ

ÖZELLİK | Property 11

- $\prod_{k=r}^{n} f(k) = \dfrac{\prod_{k=1}^{n} f(k)}{\prod_{k=1}^{r-1} f(k)}$
- $\prod_{k=r}^{n} f(k) = \prod_{k=r+a}^{n+a} f(k-a)$
- $\prod_{k=r}^{n} f(k) = \prod_{k=r-a}^{n-a} f(k+a)$

1. $\prod_{k=3}^{10} (k-2) = ?$ $\boxed{8!}$

2. $\prod_{k=-4}^{17} (k+5) = ?$ $\boxed{22!}$

3. $\prod_{k=-3}^{10} (2k+8) = ?$ $\boxed{2^{14} \cdot 14!}$

4. $\prod_{k=-5}^{12} (3k+18) = ?$ $\boxed{3^{18} \cdot 18!}$

5. $\prod_{k=-2}^{11} (k^2-1) = ?$ $\boxed{0}$

ÖZELLİK | Property 12

- $\prod_{k=r}^{n} c^{f(k)} = c^{f(r)} \cdot c^{f(r+1)} \cdot \ldots\ldots \cdot c^{f(n)}$

$$= c^{f(r)+f(r+1)+\ldots\ldots+f(n)}$$

$$= c^{\left(\sum_{k=r}^{n} f(k)\right)}$$

$$\prod_{k=r}^{n} c^{f(k)} = c^{\left(\sum_{k=r}^{n} f(k)\right)}$$

1. $\prod_{k=1}^{10} 2^k = ?$ $\boxed{2^{55}}$

2. $\prod_{k=4}^{20} (3^{k-3}) = ?$ $\boxed{3^{153}}$

3. $\prod_{k=1}^{15} \left(\frac{1}{4^k}\right) = ?$ $\boxed{\frac{1}{2^{240}}}$

4. $\prod_{k=2}^{12} (3^{k^2-1}) = ?$ $\boxed{3^{638}}$

5. $\prod_{k=1}^{11} \sqrt{6^k} = ?$ $\boxed{6^{33}}$

ÖZELLİK | Property 13

$a, b, m, n \in Z$

$$\sum_{i=b}^{m}\sum_{k=a}^{n} f(k, i) = \sum_{i=b}^{m}\underbrace{\left(\sum_{k=a}^{n} f(k, i)\right)}_{\text{i sabit } (concent)}$$

1. $\sum_{i=0}^{2}\sum_{k=1}^{3}(k^3+1) = ?$ — $\boxed{117}$

2. $\sum_{i=1}^{3}\sum_{k=0}^{4}(k+2i) = ?$ — $\boxed{90}$

3. $\sum_{k=1}^{10}\sum_{t=1}^{k}\left(t+\frac{1}{2}\right) = ?$ — $\boxed{\frac{495}{2}}$

4. $\sum_{k=1}^{3}\prod_{n=1}^{k}\frac{n}{n+1} = ?$ — $\boxed{\frac{13}{12}}$

5. $\prod_{k=1}^{3}\sum_{n=1}^{k}(n+1) = ?$ — $\boxed{90}$

6. $\sum_{n=0}^{2}\prod_{i=1}^{2}(i+n) = ?$ — $\boxed{20}$

7. $\prod_{k=-1}^{2}\prod_{r=1}^{3}(r\cdot k) = ?$ — $\boxed{0}$

ÖZELLİK | Property 14

- $\sum_{k=r}^{n}\frac{1}{k(k+1)} = \sum_{k=r}^{n}\left(\frac{1}{k}-\frac{1}{k+1}\right)$
- $\frac{1}{k(k+a)} = \frac{1}{a}\left(\frac{1}{k}-\frac{1}{k+a}\right)$
- $\frac{1}{nk(nk+a)} = \frac{1}{a}\left(\frac{1}{nk}-\frac{1}{nk+a}\right)$

1. $\sum_{k=1}^{100}\frac{1}{k\cdot(k+1)} = ?$ — $\boxed{\frac{100}{101}}$

2. $\sum_{k=1}^{12}\frac{1}{k\cdot(k+2)} = ?$ — $\boxed{\frac{123}{182}}$

3. $\sum_{k=2}^{7}\left(\frac{1}{k^2-1}\right) = ?$ — $\boxed{\frac{69}{112}}$

4. $\sum_{k=2}^{9}\left(\frac{1}{k^2-1}\right) = ?$ — $\boxed{\frac{29}{45}}$

5. $\sum_{k=1}^{10}\left(\frac{1}{k\cdot(k+3)}\right) = ?$ — $\boxed{\frac{905}{1716}}$

6. $\sum_{k=1}^{6}\left(\frac{1}{4k^2-1}\right) = ?$ — $\boxed{\frac{6}{13}}$

7. $\sum_{k=7}^{20}\left(\frac{1}{k\cdot(k+1)}\right) = ?$ — $\boxed{\frac{2}{21}}$

TOPLAM ÇARPIM SEMBOLÜ

TEST 1

1. $\sum_{k=1}^{6} k = ?$

A) 6 B) 12 C) 15 D) 21 E) 42

2. $\sum_{k=1}^{5} (k-1) = ?$

A) 6 B) 10 C) 11 D) 14 E) 15

3. $\sum_{x=1}^{4} x^2 = ?$

A) 27 B) 30 C) 32 D) 36 E) 38

4. $\sum_{k=1}^{4} (k-2)^2 = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

5. $\sum_{k=1}^{6} ((-1)^k \cdot k) = ?$

A) -3 B) 0 C) 3 D) 6 E) 10

6. $\sum_{k=-3}^{4} ((-1)^k \cdot k^2) = ?$

A) -5 B) -3 C) 0 D) 3 E) 4

7. $\sum_{k=1}^{3} \left(\frac{k+1}{k}\right) = ?$

A) 2 B) 4 C) $\frac{29}{6}$ D) 10 E) $\frac{25}{2}$

8. $\sum_{k=1}^{5} 2^k = ?$

A) 24 B) 32 C) 62 D) 2^{15} E) 2^{24}

9. $\sum_{k=1}^{4} k! = ?$

A) 24 B) 30 C) 33 D) 120 E) 720

10. $\sum_{k=13}^{15} (k-12)! = ?$

A) 6 B) 9 C) 12 D) 24 E) 36

11. $\sum_{k=6}^{8} \binom{k-1}{4} = ?$

A) 35 B) 50 C) 55 D) 70 E) 85

12. $\sum_{k=1}^{4} ((k+1)\cdot k!) = ?$

A) 96 B) 104 C) 144 D) 120 E) 152

13. $\sum_{k=-6}^{7} k = ?$

A) –7 B) –6 C) 0 D) 6 E) 7

14. $\sum_{k=1}^{15} 5 = ?$

A) 75 B) 60 C) 55 D) 15 E) 5

15. $\sum_{k=0}^{6} 3 = ?$

A) 12 B) 15 C) 18 D) 21 E) 24

16. $\sum_{k=-3}^{2} 3 = ?$

A) 12 B) 15 C) 16 D) 18 E) 24

TOPLAM ÇARPIM SEMBOLÜ

TEST 2

1. $\sum_{k=4}^{41} 1 = ?$

A) 41 B) 40 C) 39 D) 38 E) 37

2. $\sum_{k=-5}^{42} 1 = ?$

A) 48 B) 47 C) 46 D) 45 E) 40

3. $\sum_{k=x}^{4x+1} 1 = 32$

$\Rightarrow x = ?$

A) 9 B) 10 C) 11 D) 12 E) 13

4. $\sum_{k=1}^{30} 5 = ?$

A) 30 B) 120 C) 150 D) 200 E) 250

5. $\sum_{k=12}^{24} 2 = ?$

A) 24 B) 26 C) 28 D) 30 E) 32

6. $\sum_{k=-10}^{20} 3 = ?$

A) 84 B) 87 C) 90 D) 93 E) 96

7. $\sum_{k=1}^{20} k = ?$

A) 180 B) 185 C) 190 D) 210 E) 231

8. $\sum_{k=1}^{20} (k-2) = ?$

A) 149 B) 170 C) 171 D) 180 E) 181

9. $\sum_{k=1}^{15} (2k-1) = ?$

A) 255 B) 240 C) 225 D) 215 E) 210

10. $\sum_{k=1}^{7} k^2 = ?$

A) 104 B) 124 C) 140 D) 184 E) 204

11. $\sum_{k=1}^{13} (k^2+1) = ?$

A) 809 B) 819 C) 822 D) 832 E) 932

12. $\sum_{k=1}^{5} (2k^2-7k+5) = ?$

A) 20 B) 25 C) 30 D) 45 E) 47

13. $\sum_{k=1}^{9} (2k+1)^2 = ?$

A) 1140 B) 1320 C) 1329 D) 1419 E) 1429

14. $\sum_{k=1}^{7} [(k-1)\cdot(k+1)] = ?$

A) 132 B) 133 C) 140 D) 147 E) 154

15. $\sum_{k=1}^{10} k^3 = ?$

A) 2020 B) 2038 C) 3024 D) 3025 E) 3052

16. $\sum_{k=1}^{8} (k^3-2) = ?$

A) 1096 B) 1280 C) 1296 D) 1302 E) 1312

1. $1 - 2 + 3 - 4 + ... + 43 - 44 = ?$

A) –22 B) –21 C) –11 D) 24 E) 33

2. $\sum_{k=1}^{40} \left((-1)^k \cdot k\right) = ?$

A) 10 B) 15 C) 20 D) 30 E) 40

3. $1 - 2 + 3 - 4 + ... - 34 + 35 = ?$

A) –18 B) –17 C) 17 D) 18 E) 35

4. $1 - 3 + 5 - 7 + 9 - .... - 43 + 45 = ?$

A) –22 B) –20 C) 0 D) 22 E) 23

5. $f(x) = 2x + 1$

$\Rightarrow \sum_{k=1}^{3} f(k) = ?$

A) 8 B) 10 C) 12 D) 15 E) 19

6. $f(x) = 3x + a$

$\sum_{k=1}^{3} f(k) = 6$

$\Rightarrow a = ?$

A) – 4 B) – 2 C) 2 D) 4 E) 5

7. $f(x) = x + 5$

$\sum_{k=-2}^{0} f(k) = 3m - 3$

$\Rightarrow m = ?$

A) –2 B) –1 C) 3 D) 4 E) 5

8. $\sum_{k=1}^{15} (\sqrt{k} - \sqrt{k+1}) = ?$

A) –5 B) –3 C) –2 D) –1 E) 2

9. $\sum_{k=1}^{63} (\sqrt{k+1} - \sqrt{k}) = ?$

A) 4 B) 6 C) 7 D) 8 E) 9

10. $\sum_{k=1}^{60} (\sqrt{k+4} - \sqrt{k+3}) = ?$

A) 13 B) 12 C) 10 D) 9 E) 6

11. $1 + 2 + 3 + ... + 75$

toplamı aşağıdakilerden hangisi ile ifade edilir?

Which of the following states the sum of $1 + 2 + 3 + ... + 75$?

A) $\sum_{k=1}^{70} (k+5)$ B) $\sum_{k=0}^{74} (k+2)$ C) $\sum_{k=1}^{74} k$

D) $\sum_{k=2}^{76} (k-1)$ E) $\sum_{k=0}^{75} (k+1)$

12. $8 + 11 + ... + 68$

toplamı aşağıdakilerden hangisi ile ifade edilir?

Which of the following states the sum of $8 + 11 + ... + 68$?

A) $\sum_{k=5}^{95} k$ B) $\sum_{k=5}^{33} (3k+2)$ C) $\sum_{k=1}^{31} (4k+1)$

D) $\sum_{k=1}^{21} (3k+5)$ E) $\sum_{k=2}^{33} (3k-4)$

13. $9 + 14 + 21 + 30 + 41 + ... + 149$

toplamı aşağıdakilerden hangisi ile ifade edilir?

Which of the following states the sum $9 + 14 + 21 + 30 + 41 + ... + 149$?

A) $\sum_{k=12}^{137} k$ B) $\sum_{k=2}^{11} (k^2+3)$ C) $\sum_{k=1}^{12} (k^2+3)$

D) $\sum_{k=4}^{49} 3k$ E) $\sum_{k=2}^{12} (k^2+5)$

14. $\frac{1}{6\cdot 7} + \frac{1}{7\cdot 8} + \frac{1}{8\cdot 9} + ... + \frac{1}{22\cdot 23}$

toplamı aşağıdakilerden hangisi ile ifade edilir?

which of the following states the sum of $\frac{1}{6\cdot 7} + \frac{1}{7\cdot 8} + \frac{1}{8\cdot 9} + ... + \frac{1}{22\cdot 23}$?

A) $\sum_{k=1}^{22} \frac{1}{k\cdot(k+1)}$ B) $\sum_{k=5}^{20} \frac{1}{(k+1)\cdot(k+2)}$

C) $\sum_{k=6}^{22} \frac{1}{k\cdot(k+1)}$ D) $\sum_{k=7}^{20} \frac{1}{k\cdot(k-1)}$

E) $\sum_{k=6}^{20} \frac{1}{k\cdot(k-1)}$

15. $1\cdot 4 + 2\cdot 5 + 3\cdot 6 + ... + 25\cdot 28$

toplamı aşağıdakilerden hangisi ile ifade edilir?

Which of the following states the sum $1\cdot 4 + 2\cdot 5 + 3\cdot 6 + ... + 25\cdot 28$?

A) $\sum_{k=1}^{20} (k\cdot(k+2))$ B) $\sum_{m=1}^{23} (m\cdot(m+3))$

C) $\sum_{i=1}^{21} (i\cdot(i+4))$ D) $\sum_{k=1}^{24} (k\cdot(3k-1))$

E) $\sum_{k=1}^{25} (k\cdot(k+3))$

16. $\frac{1}{4} + \frac{2}{9} + \frac{3}{16} + ... + \frac{15}{256}$

toplamı aşağıdakilerden hangisi ile ifade edilir?

Which of the following states the sum $\frac{1}{4} + \frac{2}{9} + \frac{3}{16} + ... + \frac{15}{256}$?

A) $\sum_{k=1}^{15} \frac{k}{k^2+2}$ B) $\sum_{k=1}^{14} \frac{k}{3k+1}$ C) $\sum_{k=1}^{14} \frac{2k}{(k+1)^2}$

D) $\sum_{k=-1}^{13} \frac{k+2}{(k+3)^2}$ E) $\sum_{k=2}^{14} \frac{k}{(k-1)^2}$

1. $\sum_{k=1}^{40} 2^k = ?$

A) $2^{41} - 2$ B) $2^{41} - 1$ C) $2^{40} - 1$ D) 2^{39} E) $2^{39} - 1$

2. $\sum_{k=1}^{10} \left(\frac{1}{2}\right)^{k-1} = ?$

A) $1 - 2^{-9}$ B) $2 - 2^{-9}$ C) $2 - 2^{9}$ D) $1 - 2^{10}$ E) $2 - 2^{-11}$

3. $\sum_{k=0}^{40} (2 \cdot 3^k) = 3^{n+1} - 1$

$\Rightarrow n = ?$

A) 38 B) 39 C) 40 D) 41 E) 42

4. $\sum_{k=1}^{7} 4^{k+1} = ?$

A) 2^{13} B) $\frac{2^{11}-2}{3}$ C) $\frac{2^{13}-2^3}{3}$ D) $\frac{2^{20}-2^4}{3}$ E) $\frac{2^{18}-2^4}{3}$

5. $f(x) = \sum_{k=1}^{x} (k+2)$

$g(x) = \sum_{k=3}^{x} 2^{k+1}$

$\Rightarrow (fog)(4) = ?$

A) 1106 B) 1176 C) 1224 D) 1272 E) 1306

6. $\sum_{k=1}^{21} [(-1)^{2k-3} \cdot 2^{k-1}] = ?$

A) $\frac{2^{21}-1}{3}$ B) $1 - 2^{20}$ C) $2^{21} - 1$ D) $\frac{1-2^{21}}{3}$ E) $1 - 2^{21}$

7. $\sum_{k=1}^{30} \frac{1}{k \cdot (k+1)} = ?$

A) 930 B) $\frac{29}{30}$ C) $\frac{30}{31}$ D) $\frac{1}{2}$ E) $\frac{1}{930}$

8. $\frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \ldots + \frac{1}{19 \cdot 20} = ?$

A) $\frac{19}{20}$ B) $\frac{4}{5}$ C) $\frac{1}{4}$ D) $\frac{1}{5}$ E) $\frac{9}{20}$

9. $\sum_{k=-1}^{22} \frac{1}{(k+5)\cdot(k+6)} = ?$

A) $\frac{1}{4}$ B) $\frac{3}{14}$ C) $\frac{1}{14}$ D) $\frac{1}{28}$ E) $\frac{1}{56}$

10. $\sum_{k=2}^{19} \frac{1}{k^2+3k+2} = ?$

A) $\frac{1}{7}$ B) $\frac{2}{7}$ C) $\frac{3}{7}$ D) $\frac{4}{7}$ E) $\frac{6}{7}$

11. $\sum_{k=3}^{m+1} \frac{1}{k^2-3k+2} = \frac{5}{6}$

$\Rightarrow m = ?$

A) 9 B) 8 C) 7 D) 6 E) 5

12. $\sum_{k=3}^{7} [(k-3)\cdot(k-4)\cdot(k-5)] = ?$

A) –30 B) –18 C) 0 D) 18 E) 30

13. $\sum_{k=22}^{25} [(k-22)\cdot(k-23)] = ?$

A) –2 B) 2 C) 4 D) 6 E) 8

14. $\sum_{k=3}^{7} [(k-2)\cdot(k-3)\cdot(k-4)] = ?$

A) 0 B) 40 C) 80 D) 85 E) 90

15. $\sum_{k=1}^{n} k = A$

$\sum_{k=1}^{n} (5k^3 + k)$

ifadesinin A türünden değeri nedir?

What is the value of the expression above in terms of A?

A) $A + 6$ B) $5A + 1$ C) $A^3 + A$ D) $5A^2 + A$ E) $5A^3 + 5$

16. $\sum_{k=-6}^{6} (k^3 + k) = ?$

A) 240 B) 225 C) 105 D) 0 E) – 240

1. $\sum_{k=5}^{13}(k-4)^2 = ?$

A) 285 B) 315 C) 320 D) 342 E) 385

2. $\sum_{k=3}^{7}(k^2-5k+6) = ?$

A) 35 B) 40 C) 45 D) 60 E) 70

3. $\sum_{k=-2}^{4}(x-y) = 21$ $\sum_{k=-1}^{6}(x+y) = 104$

$\Rightarrow x = ?$

A) 3 B) 4 C) 5 D) 6 E) 8

4. $\sum_{k=3}^{7}a_k = 105$ $\sum_{k=8}^{12}a_k = 710$

$\Rightarrow \sum_{k=3}^{12}a_k = ?$

A) 515 B) 605 C) 710 D) 725 E) 815

5. $\sum_{k=1}^{63}\log_2\left(1+\frac{1}{k}\right) = ?$

A) 4 B) 5 C) 6 D) 7 E) 8

6. $\sum_{k=2}^{199}\log\left(1-\frac{1}{k+1}\right) = ?$

A) -2 B) -3 C) -4 D) -5 E) -6

7. $\sum_{k=10}^{17}(k^{\log_k 5}) = ?$

A) 30 B) 35 C) 40 D) 48 E) 55

8. $\sum_{k=1}^{6}(16^{\log_4 k}) = ?$

A) 87 B) 91 C) 93 D) 112 E) 116

9. $\sum_{k=1}^{x} \log 2^{k-1} = 6\log 2$

$\Rightarrow x = ?$

A) 3 B) 4 C) 5 D) 6 E) 8

10. $\sum_{k=1}^{2} \sum_{p=1}^{3} (k+p) = ?$

A) 12 B) 18 C) 21 D) 23 E) 25

11. $\sum_{k=1}^{5} \sum_{i=1}^{3} (2k+i-1) = ?$

A) 75 B) 90 C) 95 D) 105 E) 110

12. $\sum_{k=1}^{4} \sum_{p=1}^{3} k^p = ?$

A) 140 B) 148 C) 160 D) 170 E) 184

13. $\sum_{k=1}^{6} \sum_{t=2}^{8} (3k+2t) = ?$

A) 420 B) 441 C) 483 D) 511 E) 861

14. $\sum_{m=1}^{4} \sum_{n=1}^{3} (m \cdot n) = ?$

A) 30 B) 45 C) 60 D) 90 E) 120

15. $\sum_{k=1}^{4} \sum_{m=1}^{k} (2m) = ?$

A) 40 B) 45 C) 50 D) 60 E) 70

16. $\sum_{m=2}^{7} \sum_{n=1}^{m} (4n-2m) = ?$

A) 64 B) 60 C) 58 D) 56 E) 54

1. $\sum_{k=1}^{17}\left(\sin \frac{k\pi}{2}\right) = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

2. $\sum_{k=90}^{270}(\sin k^\circ) = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

3. $\sum_{k=0}^{359}(\cos k^\circ) = ?$

A) –1 B) $\frac{-1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

4. $\sum_{p=0}^{89}(\sin^2 p^\circ) = ?$

A) 43 B) 44 C) 44,5 D) 45 E) 45,5

5. $f(x) = 4x + 1$

$x_2 = 2$

$x_3 = 3$

$\Rightarrow \sum_{k=2}^{3}(x_k + 1)\cdot f(x_k) = ?$

A) 79 B) 74 C) 68 D) 65 E) 62

6. $f(x) = 2x - 1$

$x_1 = 2, \quad x_2 = -1$

$x_3 = 4$

$\Rightarrow \sum_{k=1}^{3}(x_k \cdot f(x_k)) = ?$

A) 17 B) 19 C) 25 D) 31 E) 37

7. $f(x) = \sum_{k=1}^{x}(3k - 2)$

$\Rightarrow (fof)(2) = ?$

A) 20 B) 25 C) 30 D) 35 E) 45

8. $f(x) = 2x - 3$

$g(x) = x^2 + 1$

$\Rightarrow \sum_{k=1}^{4}(fog)(2) = ?$

A) 35 B) 28 C) 24 D) 20 E) 18

9. $f(x) = \sum_{k=1}^{x} (k+1)$

$g(x) = \sum_{k=1}^{x+1} k$

$\Rightarrow (gof)(2) = ?$

A) 12 B) 13 C) 14 D) 15 E) 21

10. $f(x) = x + 2$

$g(x) = x^2 - 1$

$\Rightarrow \sum_{x=2}^{3} (gof)(x) = ?$

A) 39 B) 38 C) 35 D) 33 E) 30

11. $f(x) = \sum_{k=1}^{x} (k+3)$

$\Rightarrow f^{-1}(9) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

12. $\sum_{k=1}^{20} [f(k) - f(k+1)] = 55$

$f(1) = 5$

$\Rightarrow f(21) = ?$

A) –70 B) –65 C) –60 D) –55 E) –50

13. $x^2 - 5x - 6 = 0$

S.S. $= \{x_1, x_2\}$

$\Rightarrow \sum_{k=1}^{2} x_k = ?$

A) –6 B) –5 C) 0 D) 5 E) 6

14. $x^2 - 6x - 2 = 0$

S.S. $= \{x_1, x_2\}$

$\Rightarrow \sum_{m=1}^{2} x_m^2 = ?$

A) 40 B) 38 C) 36 D) 32 E) 30

15. $x^2 - 4x - 6 = 0$

S.S. $= \{x_1, x_2\}$

$\Rightarrow \sum_{k=1}^{2} \frac{1}{x_k} = ?$

A) $\frac{5}{4}$ B) $\frac{2}{3}$ C) $\frac{3}{5}$ D) $\frac{-1}{4}$ E) $\frac{-2}{3}$

16. $\sum_{k=n}^{2n} k^3 = an^4 + bn^3 + cn^2 + dn + e$

$\Rightarrow a + b + c + d + e = ?$

A) 36 B) 32 C) 18 D) 9 E) 8

1. $\prod_{k=1}^{16} k = ?$

A) 8 B) 16 C) 8! D) 16! E) 32!

2. $\prod_{k=1}^{4} 3 = ?$

A) 12 B) 48 C) 64 D) 81 E) 243

3. $\prod_{k=1}^{4} (2k) = ?$

A) 32 B) 48 C) 192 D) 384 E) 422

4. $\prod_{k=3}^{5} k! = ?$

A) 120 B) 150 C) 3024 D) 14280 E) 17280

5. $\prod_{k=3}^{4} (k!+1) = ?$

A) 7 B) 25 C) 32 D) 145 E) 175

6. $\prod_{k=1}^{40} \frac{k}{k+1} = ?$

A) $\frac{1}{40}$ B) $\frac{1}{41}$ C) $\frac{1}{42}$ D) $\frac{20}{21}$ E) $\frac{40}{41}$

7. $\prod_{k=1}^{13} \left(1-\frac{5}{k}\right) = ?$

A) 11 B) 0 C) $\frac{1}{2}$ D) $\frac{1}{11}$ E) $\frac{1}{12}$

8. $\prod_{x=3}^{k} \left(1+\frac{1}{x}\right) = 2k-13$

$\Rightarrow k = ?$

A) 4 B) 5 C) 6 D) 8 E) 9

9. $\prod_{k=1}^{7} 2^{k+1} = ?$

A) 2^{15} B) 2^{20} C) 2^{30} D) 2^{35} E) 2^{36}

10. $\prod_{k=3}^{8} 3^k = 27^x$

$\Rightarrow x = ?$

A) 6 B) 7 C) 8 D) 9 E) 11

11. $\prod_{k=1}^{n} 7^k = 7^{21}$

$\Rightarrow n = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

12. $i^2 = -1$

$\Rightarrow \prod_{k=1}^{45} i^k = ?$

A) 1 B) -1 C) i D) $-i$ E) $2i$

13. $f(x) = \prod_{k=1}^{x} (7-k)$

$\Rightarrow f(13) = ?$

A) -12 B) 0 C) 40 D) 8! E) 13!

14. $\prod_{k=3}^{26} \log_k(k+1) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

15. $\prod_{k=4}^{33} \log_{k-2}(k-1) = ?$

A) 8 B) 7 C) 6 D) 5 E) 4

16. $\prod_{k=1}^{115} (\cos k°) = ?$

A) -1 B) $-\frac{1}{\sqrt{3}}$ C) 0 D) $\frac{1}{\sqrt{3}}$ E) $\frac{\sqrt{3}}{2}$

1. $\prod_{k=-10}^{10} 3^k = ?$

A) 3^{-20} B) 0 C) 1 D) 3 E) 3^{20}

2. $a, b \in Z$

$\prod_{k=1}^{6} (4 \cdot 3^k) = 2^a \cdot 3^b$

$\Rightarrow b - a = ?$

A) 26 B) 22 C) 20 D) 19 E) 9

3. $\prod_{k=-1}^{3} (0,5)^k = 2^x$

$\Rightarrow x = ?$

A) –5 B) –4 C) –3 D) –2 E) –1

4. $\prod_{k=1}^{8} \left(\frac{2}{5}\right)^{2k} = \left(\frac{25}{4}\right)^x$

$\Rightarrow x = ?$

A) –36 B) –18 C) 0 D) 18 E) 36

5. $\prod_{k=1}^{x} 6^{k-1} = 6^{10}$

$\Rightarrow x = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

6. $\prod_{k=1}^{40} [(k-24) \cdot (k-25)] = ?$

A) –25 B) –4 C) 0 D) 24! E) 25!

7. $\prod_{k=1}^{20} (k^3 - 5k^2) = ?$

A) –20 B) 0 C) 20 D) 7245 E) 7250

8. $\prod_{k=1}^{20} (k-4)^5 = ?$

A) –256 B) –156 C) 0 D) 156 E) 256

9. $\prod_{k=1}^{48} \sqrt{1-\frac{1}{k+1}} = ?$

A) $\frac{1}{49}$ B) $\frac{1}{16}$ C) $\frac{1}{7}$ D) $\frac{1}{4}$ E) $\frac{1}{2}$

10. $\prod_{k=2}^{20} \sqrt{1-\frac{2k-1}{k^2}} = ?$

A) $\frac{1}{20}$ B) $\frac{1}{50}$ C) $\frac{1}{100}$ D) $\frac{1}{200}$ E) $\frac{1}{400}$

11. $\prod_{k=1}^{7} (2^k \cdot k) = ?$

A) $2^{14} \cdot 6!$ B) $2^{14} \cdot 7!$ C) $2^{28} \cdot 6!$ D) $2^{28} \cdot 7!$ E) $2^{56} \cdot 7!$

12. $\prod_{k=1}^{n} a_k = n^2 + 2$

$\Rightarrow a_3 = ?$

A) $\frac{7}{3}$ B) $\frac{11}{6}$ C) $\frac{5}{2}$ D) 2 E) 1

13. $\prod_{k=4}^{n} a_k = n!$

$\Rightarrow a_6 = ?$

A) 6 B) 7 C) 8 D) 9 E) 12

14. $\prod_{k=-3}^{n-3} a_{k+4} = 2^n \cdot (n+1)!$

$\Rightarrow a_6 \cdot a_7 = ?$

A) 140 B) 150 C) 168 D) 172 E) 180

15. $\prod_{k=2}^{25} \frac{(k+1)(-1)^{k+1}}{(k+2)} = ?$

A) $-\frac{1}{27}$ B) $-\frac{1}{3}$ C) 1 D) $\frac{1}{9}$ E) $\frac{1}{27}$

16. $\prod_{k=1}^{8} \frac{k^2+5k+6}{k^2+7k+12} = ?$

A) 0 B) 1 C) $\frac{1}{11}$ D) $\frac{1}{40}$ E) $\frac{1}{55}$

1. $\prod_{k=90}^{270} (\cos k° + \sin k°) = ?$

A) $-\frac{\sqrt{3}}{2}$ B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

2. $\prod_{k=1}^{5} 4^{\tan\frac{k\pi}{3}} = ?$

A) $\frac{1}{4}$ B) 1 C) $4^{\sqrt{3}}$ D) $4^{\frac{1}{\sqrt{3}}}$ E) 4

3. $0° < \alpha < 90°$

$\Rightarrow \sum_{k=1}^{4} \sin\left(\frac{k\pi}{2} + \alpha\right) = ?$

A) 0 B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{3}{2}$ E) 2

4. $x^2 + 2x - 4 = 0$, S.S. $= \{x_1, x_2\}$

$\Rightarrow \prod_{k=1}^{2} (x_k + 1) = ?$

A) 0 B) –1 C) –2 D) –4 E) –5

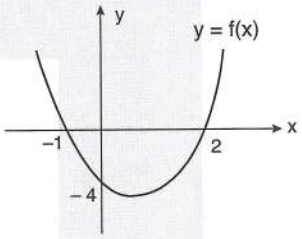
5. $x^2 + ax + 2 = 0$ S.S. $= \{x_1, x_2\}$

$\prod_{k=1}^{2} (2x_k - 1) = 23$

$\Rightarrow a = ?$

A) – 5 B) – 4 C) 3 D) 5 E) 7

6.



$f(x) = ax^2 + bx + c$

$\Rightarrow \prod_{k=0}^{1} f(k) = ?$

A) 16 B) 4 C) 2 D) 1 E) 0

7. $\log_3\left(\prod_{k=1}^{n} 3^k\right) = 15$

$\Rightarrow n = ?$

A) 10 B) 9 C) 8 D) 6 E) 5

8. $\prod_{m=-3}^{7} \sum_{n=1}^{9} \log\left(1 + \frac{1}{n}\right) = ?$

A) –11 B) –1 C) 1 D) 10 E) 11

9. $\sum_{k=1}^{4} \log_2\left(\prod_{m=1}^{k} 4^{m+1}\right) = ?$

A) 40 B) 45 C) 60 D) 68 E) 75

10. $f(x) = \frac{x-1}{3}$

$\Rightarrow \prod_{k=1}^{3} (f^{-1}(k) + 1) = ?$

A) 0 B) 4 C) 114 D) 135 E) 440

11. $f(x) = 2x + 4$

$\Rightarrow \prod_{k=2}^{6} (f^{-1}(k) + 2) = ?$

A) 0 B) $\frac{6!}{128}$ C) $\frac{6!}{32}$ D) 5 E) $\frac{6!}{2}$

12. $f(x) = \prod_{k=1}^{x+1} \left(\frac{1}{3}\right)^k$

$g(x) = \prod_{k=1}^{x-2} k$

$\Rightarrow (fog)(4) = ?$

A) 9 B) 3 C) 1 D) 3^{-3} E) 3^{-6}

13. $f(x) = \prod_{k=1}^{x-2} (2k)$

$g(x) = \prod_{k=0}^{x} (k+1)$

$\Rightarrow (gof)(3) = ?$

A) 42 B) 36 C) 24 D) 12 E) 6

14. $\left(\prod_{k=1}^{9} 3\right)\left(\prod_{m=1}^{4} 9^{-1}\right) = ?$

A) $\frac{1}{9}$ B) $\frac{1}{3}$ C) 3 D) 6 E) 18

15. $\prod_{k=1}^{4} \prod_{x=1}^{2} (k \cdot x) = ?$

A) 2^{36} B) 2^{34} C) $3 \cdot 2^3$ D) $3^2 \cdot 2^{10}$ E) 2^8

16. $\prod_{k=1}^{3} \prod_{n=1}^{3} \left(\frac{n}{k}\right) = ?$

A) 6 B) 3 C) 1 D) $\frac{1}{3}$ E) $\frac{1}{6}$

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TEST 10

1. $\prod_{m=1}^{2}\prod_{n=2}^{3}(3^{m\cdot n}) = ?$

A) 3^5 B) 3^{10} C) 3^{15} D) 3^{20} E) 3^{25}

2. $\prod_{k=1}^{3}\prod_{n=2}^{k}\left(1+\frac{1}{n}\right) = ?$

A) $\frac{1}{6}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) 2 E) 3

3. $\sum_{k=1}^{4}\sum_{m=1}^{4}\sum_{n=1}^{4} 3 = ?$

A) 27 B) 64 C) 81 D) 192 E) 256

4. $\sum_{k=-3}^{4}\sum_{m=2}^{199}\log\left(\frac{m}{m+1}\right) = ?$

A) –20 B) –16 C) –14 D) –10 E) –8

5. $\sum_{k=-1}^{12}(k+4) = ?$

A) 105 B) 128 C) 133 D) 145 E) 162

6. $\sum_{k=1}^{x} k^3 = 36$

$\Rightarrow x = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

7. $\sum_{k=2}^{10}(2k+1) = ?$

A) 110 B) 117 C) 120 D) 128 E) 130

8. $2 \cdot 4 \cdot 6 \ldots\ldots 30 = ?$

A) $\prod_{k=2}^{15}(2k)$ B) $\prod_{k=1}^{15}(2k)$ C) $\prod_{k=1}^{30}(2k)$

D) $\prod_{k=1}^{15}(2k!)$ E) $\prod_{k=1}^{5}(2^k)$

9. $A = \sum_{k=-5}^{5} k^3$

$B = \sum_{k=-4}^{0} 2^{-k}$

$\Rightarrow A + B = ?$

A) – 64 B) – 48 C) – 32 D) 15 E) 31

10. $\sum_{k=-5}^{6} (k^3 + k) = ?$

A) 222 B) 216 C) 42 D) 36 E) 0

11. $\sum_{k=-6}^{6} (k^3 - 3k^2 + 3k - 1) = ?$

A) – 559 B) – 343 C) – 216 D) 216 E) 343

12. $\prod_{k=1}^{180} (\sin k^\circ) = ?$

A) –1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

13. $\prod_{x=1}^{180} (\cos x^\circ - \sin x^\circ) = ?$

A) –1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

14. $(1 \cdot 3) \cdot (2 \cdot 4) \cdot (3 \cdot 5) \ldots (24 \cdot 26) = ?$

A) $\prod_{k=1}^{25} (k^2 + k)$ B) $\prod_{k=1}^{24} k(k+2)$ C) $\prod_{k=2}^{25} (k^2 + 1)$

D) $\prod_{k=2}^{25} (k^2 - 4)$ E) $\prod_{k=1}^{24} (3k^2 - 3k)$

15. $K = \underbrace{\sum_{t=1}^{10} \sum_{t=1}^{10} \ldots\ldots \sum_{t=1}^{10} 10}_{10 \text{ tane}}$

$\Rightarrow K = ?$

A) 10 B) 100 C) 10^9 D) 10^{10} E) 10^{11}

16. $\dfrac{\prod_{k=1}^{n} (k+2)}{\prod_{i=1}^{n} (i+1)} = 49$

$\Rightarrow n = ?$

A) 100 B) 98 C) 96 D) 94 E) 92

1. $1 \cdot 3 + 2 \cdot 4 + 3 \cdot 5 + ... + 9 \cdot 11 = ?$

A) 340 B) 350 C) 370 D) 375 E) 430

2. $\prod_{k=2}^{63} \log_k(k+1) = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

3. $\sum_{k=91}^{179} (\cos k°)^2 = ?$

A) 46 B) 45,5 C) 45 D) 44,5 E) 44

4. $\frac{10}{11} \cdot \sum_{k=1}^{5} (k,k) = ?$

A) 16 B) 15 C) 11 D) 7 E) 4

5. $\prod_{k=1}^{44} (\tan k° - \cot(46° + k°)) = ?$

A) –44 B) –1 C) 0 D) 1 E) 44

6. $x^2 - 8x + 4 = 0$

S.S. = $\{x_1, x_2\}$

$\Rightarrow \sum_{k=1}^{2} \frac{1}{x_k} = ?$

A) – 2 B) – 1 C) 1 D) 2 E) 4

7. $\sum_{k=1}^{n} a_k = n^2 + 3$

$\Rightarrow a_3 = ?$

A) 18 B) 12 C) 5 D) 4 E) 3

8. $\sum_{k=1}^{10} (a \cdot k - 1) = 100$

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

9. $x > 1$

$$\prod_{k=1}^{x} 4^k = 8^{3x-\frac{7}{3}}$$

$\Rightarrow x = ?$

A) 6 B) 7 C) 8 D) 9 E) 10

10. $\sum_{k=1}^{7} \prod_{p=4}^{15} ((k+1)\cdot(p-6)) = ?$

A) –340 B) –240 C) 0 D) 240 E) 340

11. $f(x) = \sum_{k=1}^{x} (k+3)$

$g(x) = \frac{1}{10!} \prod_{m=1}^{x} m$

$\Rightarrow (gof)(2) = ?$

A) $\frac{1}{10}$ B) 10 C) 90 D) 10! E) 11!

12. $\sum_{k=0}^{n} 2^k = 2^{40} - 1$

$\Rightarrow n = ?$

A) 43 B) 42 C) 41 D) 40 E) 39

13. $2 \cdot \sum_{k=1}^{n} 3^{k-1} = 3^{20} - 1$

$\Rightarrow n = ?$

A) 22 B) 21 C) 20 D) 19 E) 18

14. $C(n,r) = \frac{n!}{(n-r)!\cdot r!}$

$\Rightarrow \sum_{n=-3}^{14} C(n+5,\ n+4) = ?$

A) 135 B) 145 C) 161 D) 189 E) 191

15. $\prod_{k=1}^{x} 3^{4k-3} = 9^{33}$

$\Rightarrow x = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

16. $\prod_{k=1}^{10} \frac{k}{k+2} = ?$

A) $\frac{11}{7}$ B) $\frac{3}{22}$ C) $\frac{1}{66}$ D) $\frac{1}{132}$ E) $\frac{123}{91}$

1. $\prod_{k=1}^{10}\left(\frac{1}{9}\right)^k = 3^{5x-5}$

$\Rightarrow x = ?$

A) – 19 B) – 20 C) – 21 D) – 22 E) – 23

2. $2 \cdot 1 + 5 \cdot 2 + 10 \cdot 3 + 17 \cdot 4 + ... + 65 \cdot 8 = ?$

A) 1280 B) 1332 C) 1444 D) 1600 E) 1720

3. $\prod_{k=1}^{3}(-k)^{k-2} = ?$

A) –6 B) –4 C) –3 D) 3 E) 6

4. $a, b, c \in Z$

$\prod_{k=-3}^{2}(k+4) = 2^a \cdot 3^b \cdot 5^c$

$\Rightarrow a + b + c = ?$

A) 5 B) 6 C) 7 D) 8 E) 10

5. $\sum_{i=1}^{3}\sum_{j=1}^{2}(i \cdot j) = ?$

A) 10 B) 18 C) 24 D) 30 E) 32

6. $\prod_{k=3}^{4}(k+a) = \sum_{n=1}^{5}(n+3)$

$\Rightarrow a = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

7. $\prod_{k=1}^{9}(2^k - 32) = ?$

A) 2^{10} B) 2^7 C) 2^2 D) 1 E) 0

8. $\sum_{k=3}^{14}\left(\frac{1}{k+1} - \frac{1}{k+2}\right) = ?$

A) $\frac{3}{4}$ B) $\frac{1}{5}$ C) $\frac{2}{7}$ D) $\frac{1}{8}$ E) $\frac{3}{16}$

9. $\sum_{n=1}^{4} \prod_{k=1}^{n} \left(1+\frac{1}{k}\right) = ?$

A) 10 B) 12 C) 14 D) 20 E) 24

10. $\sum_{n=1}^{2} \prod_{k=1}^{3} (k+n) = ?$

A) 84 B) 80 C) 76 D) 70 E) 60

11. $\prod_{k=1}^{3} \sum_{j=1}^{2} (j^k) = ?$

A) 80 B) 100 C) 108 D) 120 E) 135

12. $f(x) = \prod_{k=1}^{3} (x+k)$

$g(x) = \sum_{k=1}^{x} (k-2)$

$\Rightarrow (gof)(3) = ?$

A) 6000 B) 6060 C) 6800 D) 7000 E) 7020

13. $\prod_{i=1}^{4} (i+2) = \sum_{k=0}^{3} (3k+a)$

$\Rightarrow a = ?$

A) $\frac{171}{2}$ B) 45 C) $\frac{27}{2}$ D) 12 E) $\frac{21}{2}$

14. $\prod_{k=1}^{n} a_k = n^2+2n+1$

$\Rightarrow a_6 = ?$

A) $\frac{49}{36}$ B) $\frac{45}{12}$ C) $\frac{40}{7}$ D) 12 E) 13

15. $x^2+4x+3=0$

$S.S. = \{x_1, x_2\}$

$f(x) = x+3$

$\Rightarrow \sum_{k=1}^{2} (x_k + f(x_k)) = ?$

A) -6 B) -5 C) -4 D) -2 E) -1

16. $\sum_{k=0}^{n-1} \log 3^{k+1} = 5 \cdot \log 27$

$\Rightarrow n = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

TOPLAM ÇARPIM SEMBOLÜ
SUMMATION AND PRODUCT NOTATION

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	B	A	C	E	C	C	C	B	C	E	E	A	D	D

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	B	C	B	D	D	B	C	C	D	C	C	B	D	B

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	C	D	E	D	A	E	B	C	E	D	D	E	C	E	D

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	C	E	D	E	C	E	B	B	D	E	E	E	D	D

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	E	E	C	A	C	B	B	C	D	A	E	C	A	E

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	C	C	C	A	E	D	B	E	A	A	E	D	A	E	D

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	D	E	E	B	B	D	D	E	D	D	B	B	D	C

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	A	A	C	C	B	C	C	A	D	B	A	C	D	C

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	A	E	E	A	E	C	C	E	C	E	E	C	D	C

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	D	B	C	A	B	B	E	A	A	C	C	B	E	C

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	D	B	C	D	C	B	B	C	A	E	C	D	D	C

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	D	C	B	A	E	E	C	A	E	E	A	A	D	D

ÖZEL TANIMLI FONKSİYONLAR

SPECIAL-DEFINED FUNCTIONS

ÖZEL TANIMLI FONKSİYONLAR

ÖZELLİK | Property 1

Bir Fonksiyonun En Geniş Tanım Kümesini Bulma

Find the Greatest Domain of a Function

- Polinomsal fonksiyonlar bütün reel sayılarda tanımlıdır.
  Polynomial functions are defined in all of the real numbers.
  $a, b, c, d \in R$
  $f(x) = ax^3 + bx^2 + cx + d$
  $f: R \to R$

- $f(x) = \dfrac{h(x)}{g(x)}$ $\quad g(a) = 0$
  $f: R \setminus \{a\} \to R$

- $n \in N$
  $f(x) = \sqrt[2n-1]{g(x)}$
  $f: R \to R$
  $f(x) = \sqrt[2n]{g(x)}$ $\quad g(x) \geq 0$
  Köklü fonksiyonun derecesi çift ise ifadenin negatif olmaması gerekir.
  If a radical function's power is even then the expression should be negative.

- $f(x) = a^{g(x)}$ $\quad a \in R^+$
  Üstel fonksiyonlar bütün reel sayılarda tanımlıdır.
  Exponential functions are defined in all of the real numbers.
  $f: R \to R$

- $f(x) = \log_a g(x)$ $\quad a \in R^+$ $\quad a \neq 1$
  Logaritma fonksiyonu pozitif reel sayılarda tanımlıdır.
  Logarithmic function is defined is positive real numbers.

- Sinüs ve kosinüs fonksiyonları bütün reel sayılarda tanımlıdır.
  Sinus and cosinus functions are defined in all of the real numbers.

- Tanjant fonksiyonu $\left(\dfrac{\pi}{2} + k\pi\right)$ $\quad k \in Z$ noktalarında tanımsızdır.
  Tangent function $\left(\dfrac{\pi}{2} + k\pi\right)$ *is undefined* $k \in Z$ *points.*

- Kotanjant fonksiyonu $k\pi$ $\quad k \in Z$ noktalarında tanımsızdır.
  Cotangent function $k\pi$ *is undefined in* $k \in Z$ *points.*

Aşağıda verilen fonksiyonların en geniş tanım kümesini bulunuz.

In following functions what is the greatest domain?

1. $f(x) = x^2 + 5$ $\quad$ R

2. $f(x) = x^3 + \sqrt{5}x^2 - 7x + 4$ $\quad$ R

3. $f(x) = \dfrac{1}{x-2}$ $\quad$ $R \setminus \{2\}$

4. $f(x) = \dfrac{1}{x^2-9}$ $\quad$ $R \setminus \{3, -3\}$

5. $f(x) = \sqrt{x-4}$ $\quad$ $[4, \infty)$

6. $f(x) = \sqrt[5]{x-1} + \sqrt{7-x}$ $\quad$ $(-\infty, 7]$

7. $f(x) = \dfrac{1}{\sqrt{x-3}}$ $\quad$ $(3, \infty)$

8. $f(x) = \sqrt[4]{x+4} + \sqrt[3]{\dfrac{x}{x-1}} + \sqrt[7]{x}$

$[-4, \infty) \setminus \{1\}$

9. $f(x) = \log(x+2)$

$(-2, \infty)$

10. $f(x) = \log(x+4) - \log(x+1)$

$(-1, \infty)$

11. $f(x) = 2^{x^2-4}$

$\mathbb{R}$

12. $f(x) = 5^{x+1} + 3^{x-1} + 7^x$

$\mathbb{R}$

13. $f(x) = 10^{x+6}$

$\mathbb{R}$

14. $f(x) = 2 \cdot \sin x - 4$

$\mathbb{R}$

15. $f(x) = \sin^3(2x-4) - x$

$\mathbb{R}$

16. $f(x) = \sin x - \cos x$

$\mathbb{R}$

17. $f(x) = \cos^2 x - \sin^2 x$

$\mathbb{R}$

18. $f(x) = \tan x$

$\mathbb{R} \setminus \left\{ \dfrac{(2k+1)\pi}{2} : k \in \mathbb{Z} \right\}$

19. $f(x) = 2\cot x - 4$

$\mathbb{R} \setminus \{k\pi : k \in \mathbb{Z}\}$

20. $f(x) = \tan x + \cot x$

$\mathbb{R} \setminus \left\{ \dfrac{k\pi}{2} : k \in \mathbb{Z} \right\}$

21. $f(x) = \dfrac{\tan x + 2}{\sin x}$

$\mathbb{R} \setminus \left\{ \dfrac{k\pi}{2} : k \in \mathbb{Z} \right\}$

ÖZEL TANIMLI FONKSİYONLAR

ÖZELLİK | Property 2

Parçalı Fonksiyon | Piecewise Function

$a \in R$

$$f(x) = \begin{cases} h(x) & x \geq a \\ g(x) & x < a \end{cases}$$

f(x) parçalı bir fonksiyondur. Bu fonksiyonun kritik noktası "a"dır. Fonksiyon "a" noktasında değişim gösterir.

f(x) is a piecewise function. "a" is the critical point of this function. Function shows transformation in point "a"

1. $f: R \to R$

$$f(x) = \begin{cases} 4 & x \geq 1 \\ x+1 & x < 1 \end{cases}$$

$\Rightarrow f(2) + f(-3) + f(1) = ?$

6

2. $f: R \to R$

$$f(x) = \begin{cases} x^2+6 & x \geq -4 \\ x-1 & x < -4 \end{cases}$$

$\Rightarrow 2f(-1) - 3f(0) + f(-5) + 5 = ?$

-5

3. $f: R \to R$

$$f(x) = \begin{cases} 14-x^2 & x \leq 2 \\ 1-6x & x > 2 \end{cases}$$

$\Rightarrow (fof)(2) = ?$

-59

4. $f: R \to R$

$$f(x) = \begin{cases} 3x+a & x \geq 0 \\ 9+x & x < 0 \end{cases}$$

$(fof)(-2) = 25$

$\Rightarrow a = ?$

4

5. $f: R \to R$

$h: R \to R$

$$f(x) = \begin{cases} x^2-4 & x > 3 \\ 1-2x & x \leq 3 \end{cases}$$

$$h(x) = \begin{cases} 2x & x > 3 \\ -4 & x \leq 3 \end{cases}$$

$\Rightarrow (f+h)(3) + (f+2h)(4) = ?$

19

6. $f: R \to R$

$$f(x) = \begin{cases} 4 & x > -2 \\ -6x & x \leq -2 \end{cases}$$

$\Rightarrow (fofof)(-3) = ?$

4

7. $f: R \to R$

$g: R \to R$

$$f(x) = \begin{cases} \dfrac{x+4}{3} & x > 7 \\ \dfrac{x}{2} & x \leq 7 \end{cases}$$

$$g(x) = \begin{cases} 2x-4 & x < 3 \\ x+7 & x \geq 3 \end{cases}$$

$\Rightarrow [(fog)(4) - (gof)(-2)] = ?$

11

ÖZELLİK | Property 3

Mutlak Değerli Fonksiyon
Absolute Value Function

$$f(x) = |g(x)|$$

$a \in R$ ve $g(a) = 0$ ise a noktası, f fonksiyonunun kritik noktasıdır. Mutlak değerli fonksiyon, parçalı fonksiyon şeklinde yazılabilir.

If $a \in R$ and $g(a) = 0$, point "a" is "f" function's critical point. Absolute value function could be written in piecewise function form.

Örnek | Example

$$f(x) = |x| = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

$$f(x) = |x-3| = \begin{cases} x-3 & x > 3 \\ -x+3 & x \leq 3 \end{cases}$$

Not | Note

Mutlak değerli fonksiyonda; eşitlik, fonksiyonun istenilen kısmına yazılabilir.

In absolute value function, equality will be written in the asked part.

Aşağıda verilen fonksiyonları, parçalı fonksiyon şeklinde yazınız.

In following, write down functions in piecewise form.

1. $f(x) = |x+4|$

$$f(x) = \begin{cases} x+4 & x \geq -4 \\ -x-4 & x < -4 \end{cases}$$

2. $f(x) = |2x-10|$

$$f(x) = \begin{cases} 2x-10 & x \geq 5 \\ 10-2x & x < 5 \end{cases}$$

3. $f(x) = |2x-1|$

$$f(x) = \begin{cases} 2x-1 & x > 1/2 \\ 1-2x & x \leq 1/2 \end{cases}$$

4. $f(x) = |5x+7|$

$$f(x) = \begin{cases} 5x+7 & x \geq -\frac{7}{5} \\ -5x-7 & x < -\frac{7}{5} \end{cases}$$

5. $f(x) = \left|\frac{x-4}{2}\right|$

$$f(x) = \begin{cases} \frac{x-4}{2} & x \geq 4 \\ \frac{4-x}{2} & x < 4 \end{cases}$$

6. $f(x) = |x^2-9|$

$$f(x) = \begin{cases} x^2-9 & x \leq -3 \\ 9-x^2 & -3 < x < 3 \\ x^2-9 & x \geq 3 \end{cases}$$

7. $f(x) = |x^2-4x+3|$

$$f(x) = \begin{cases} x^2-4x+3 & x \leq 1 \\ -x^2+4x-3 & 1 < x < 3 \\ x^2-4x+3 & x \geq 3 \end{cases}$$

8. $f(x) = |x^2-4x|$

$$f(x) = \begin{cases} x^2-4x & x \leq 0 \\ 4x-x^2 & 0 < x < 4 \\ x^2-4x & x \geq 4 \end{cases}$$

9. $f(x) = |-x^2+x|$

$$f(x) = \begin{cases} x^2-x & x \leq 0 \\ -x^2+x & 0 < x < 1 \\ x^2-x & x \geq 1 \end{cases}$$

ÖZEL TANIMLI FONKSİYONLAR

ÖZELLİK | Property 4

İşaret Fonksiyonu | Signum Function

$x \in R$

- $\operatorname{sgn}(x) = \begin{cases} 1 & x > 0 \\ 0 & x = 0 \\ -1 & x < 0 \end{cases}$

- $f(x) = \operatorname{sgn}(g(x)) = \begin{cases} 1 & g(x) > 0 \\ 0 & g(x) = 0 \\ -1 & g(x) < 0 \end{cases}$

$a \in R$ ve $g(a) = 0$ ise "a" noktası fonksiyonun kritik noktasıdır.

If $a \in R$ and $g(a) = 0$, point "a" is function critical point.

1. $\operatorname{sgn}(\pi) = ?$

$\boxed{1}$

2. $\operatorname{sgn}(x - 6) = 1$

$\Rightarrow$ S.S. = ?

$\boxed{(6, \infty)}$

3. $\operatorname{sgn}(x^2 - 16) = 0$

$\Rightarrow$ S.S. = ?

$\boxed{\{-4, 4\}}$

4. $\operatorname{sgn}(x + 7) = -1$

$\Rightarrow$ S.S. = ?

$\boxed{(-\infty, -7)}$

5. $x \in R$

$\Rightarrow \operatorname{sgn}(x^2 + x + 1) = ?$

$\boxed{1}$

6. $x \in R$

$\Rightarrow \operatorname{sgn}(x^2 + 4) = ?$

$\boxed{1}$

Aşağıda verilen fonksiyonları, parçalı fonksiyon şeklinde yazınız.

In following given functions , write them down in piecewise function form.

1. $f(x) = \operatorname{sgn}(x - 6)$

$$f(x) = \begin{cases} 1 & x > 6 \\ 0 & x = 6 \\ -1 & x < 6 \end{cases}$$

2. $f(x) = \operatorname{sgn}(x + 4)$

$$f(x) = \begin{cases} 1 & x > -4 \\ 0 & x = -4 \\ -1 & x < -4 \end{cases}$$

3. $f(x) = \operatorname{sgn}(x^2 - 16)$

$$f(x) = \begin{cases} 1 & x > 4 \ , \ x < -4 \\ 0 & x = 4 \ , \ x = -4 \\ -1 & -4 < x < 4 \end{cases}$$

4. $f(x) = \operatorname{sgn}(x^2 - 5x + 4)$

$$f(x) = \begin{cases} 1 & x < 1 \ , \ x > 4 \\ 0 & x = 1 \ , \ x = 4 \\ -1 & 1 < x < 4 \end{cases}$$

ÖZELLİK | Property 5

Tam Değer Fonksiyonu
Greatest Integer Function

$x \in R$

$[x] = x$'ten büyük olmayan en büyük tamsayıdır.

Integer that is not bigger than $[x] = x$

Örnek | Example

$[3{,}735] = 3$

$[5{,}99] = 5$

$[0{,}63] = 0$

$[-1{,}275] = -2$

$[-3{,}46] = -4$

$[4] = 4$

$x \in R$

- $[x] = a \qquad a \in Z$

- $[x] = a \qquad a \in Z$

  $\Rightarrow a \le x < a + 1$

- $[x + a] = [x] + a \qquad a \in Z$

- $[2x] = [x] + \left[x + \frac{1}{2}\right]$

  $[3x] = [x] + \left[x + \frac{1}{3}\right] + \left[x + \frac{2}{3}\right]$

  $[ax]$ fonksiyonu reel sayılarda $\frac{1}{a}$ aralıklarla incelenir.

  $[ax]$ function is examined at $\frac{1}{a}$ intervals.

  $f(x) = [g(x)]$

  $g(a) \in Z$ ise "a", f fonksiyonunun kritik noktasıdır.

  If $g(a) \in Z$ "a" is "f" functions critical point.

1. $[x + 2] = 5$
$\Rightarrow$ S.S. = ?

$[3, 4)$

2. $\left[\frac{4 - x}{3}\right] = 3$
$\Rightarrow$ S.S. = ?

$(-8, -5]$

3. $[[x + 2] + 2] = 8$
$\Rightarrow$ S.S. = ?

$[4, 5)$

4. $[x + 1] + [x + 4] = 7$
$\Rightarrow$ S.S. = ?

$[1, 2)$

5. $[x]^2 - 4[x] = 0$
$\Rightarrow$ S.S. = ?

$[0, 1) \cup [4, 5)$

6. $0 < [2x - 6] \le 10$
$\Rightarrow$ S.S. = ?

$\left[\frac{7}{2}, \frac{17}{2}\right)$

ÖZEL TANIMLI FONKSİYONLAR

ÖZELLİK | Property 6

$f: R \to R$

$f(-x) = f(x) \quad x \in R$

f fonksiyonuna çift fonksiyon denir.

function "f" is called even function.

- $f(x) = |x|$

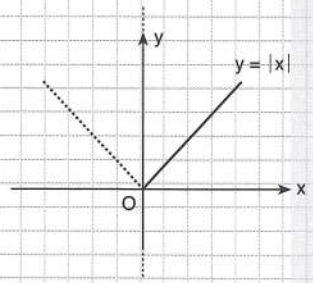
  $f(x) = \cos x$

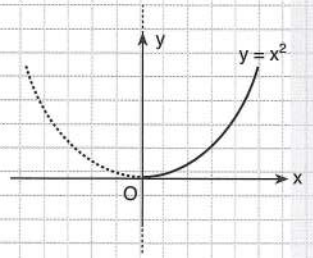
  $f(x) = k \cdot x^{2n} \quad n \in N \quad k \in R$

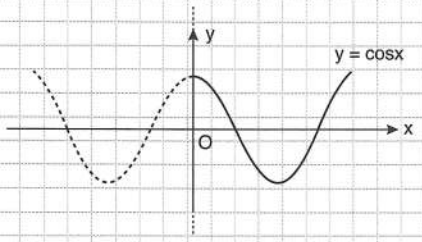
  $f(x) = k$

- Çift fonksiyonlar y eksenine göre simetriktir.

  Even functions are symmetrical according to "y" axis.







- x'in çift kuvvetlerinden oluşan fonksiyonlar çift fonksiyondur.

  Functions that are made of even powers of "x" are even functions.

  $f(x) = x^2$

  $f(x) = 3x^4 + 7$

  $f(x) = x^6 - 5x^4 + x^2 - 10$

→ f(x) çift fonksiyon *(even function)*

$f(x): R \to R$

1. $m \in R$

$f(x) = x^2 + mx - 6$

$\Rightarrow m = ?$

0

2. $a, b, c \in R$

$f(x) = ax^7 + (b + 1)x^5 + (c - 7)x^3 + 4$

$\Rightarrow a + b + c = ?$

6

3. $f(x) = x^2 + 4 - f(-x)$

$\Rightarrow f(2) = ?$

4

4. $3f(x) = f(-x) + 4x^4 - 2x^2$

$\Rightarrow f(2) = ?$

28

5. $a \in R$

$f(x) = (a - 2)x^3 + ax^2 + 4a$

$\Rightarrow f(1) = ?$

10

6. $f(x) = \cos x + |x| + x^4$

$\Rightarrow \dfrac{f(-x)}{f(x)} = ?$

1

ÖZELLİK | Property 7

$f: R \to R$

$f(-x) = -f(x)$

f fonksiyonuna tek fonksiyon denir.

function "f" is called odd

- $f(x) = x^3$

  $f(x) = \cot x$

  $f(x) = \tan x$

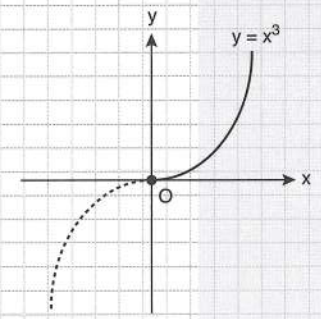
  $f(x) = \sin x$

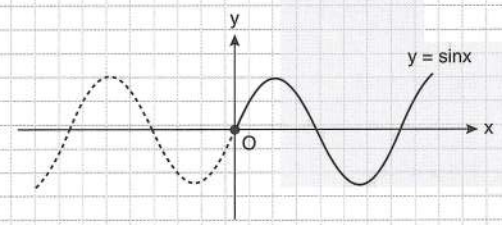
  $f(x) = \text{sgn}(x)$

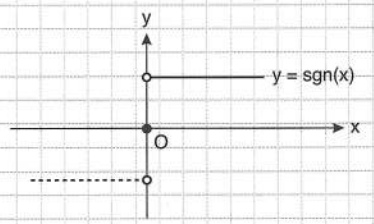
- $f(x) = k \cdot x^{2n-1}$ $\quad n \in N \quad k \in R$

- Tek fonksiyonlar orijine göre simetriktir.

  Odd functions are symmetrical according to the origin.







- x'in tek kuvvetlerinden oluşan fonksiyonlar tek fonksiyondur.

  functions that are made of odd powers of "x" are odd functions.

  $f(x) = x$

  $f(x) = x^3$

  $f(x) = 2x^5 - 3x^3 + x$

→ f(x) tek fonksiyon *(odd function)*

$f(x): R \to R$

1. $f(x) = (a-2)x^4 + (b+2)x^2 + abx$

$\Rightarrow f(x) = ?$

$\boxed{-4x}$

2. $f(x) + 2f(-x) = x^3 + 2x$

$\Rightarrow f(2) = ?$

$\boxed{-12}$

3. $f(x) = mx^3 + (m+4)x^2 + 7x$

$\Rightarrow f(-1) = ?$

$\boxed{-3}$

4. $f(x) = 5f(-x) + x^3 - 3x$

$\Rightarrow f(-3) = ?$

$\boxed{-3}$

5. $f(x) = \tan^3(x) + \sin^5(x)$

$\Rightarrow f\left(\frac{\pi}{3}\right) + f\left(-\frac{\pi}{3}\right) = ?$

$\boxed{0}$

6. $f(4) = 2$

$g(x) = 2f(-x) - x^3$

$\Rightarrow g(4) = ?$

$\boxed{-68}$

ÖZEL TANIMLI FONKSİYONLAR

Aşağıdaki fonksiyonları tek fonksiyon ve çift fonksiyon olarak inceleyiniz.

Analyzed the given functions as even and odd functions.

1. $f(x) = 5$

2. $f(x) = 3x^4 - 7$

3. $f(x) = x + 4$

4. $f(x) = 2x^4 - 16x$

5. $f(x) = x^2 + 1$

6. $f(x) = \sin x + 4$

7. $f(x) = \cos x$

8. $f(x) = x^3 . \cos x + 4$

9. $f(x) = x^3 - 7x$

10. $f(x) = \cos x + x^2$

11. $f(x) = -2\cos x + \cot x$

12. $f(x) = |x| + 7$

13. $f(x) = |x - 6| + |x|^3$

14. $f(x) = |x^3 + 5|$

15. $f(x) = \dfrac{1}{x+4}$

16. $f(x) = \dfrac{1}{x^2 - 16}$

17. $f(x) = \dfrac{\sin x}{\cos x + 4}$

18. $f(x) = 7x$

19. $f(x) = 4 - 6x$

20. $f(x) = x^2 + x$

21. $f(x) = x^3 - 7x$

22. $f(x) = x^7 - 4x^5 - 19$

23. $f(x) = x^4 + 1$

24. $f(x) = \sin x$

25. $f(x) = 2\cos x + 1$

26. $f(x) = \cos^2 x - \tan x$

27. $f(x) = \tan x$

28. $f(x) = \dfrac{\cos x}{\sin x}$

29. $f(x) = x^5 + 7x^3 + x$

30. $f(x) = x \cdot \cos x$

31. $f(x) = x^2 \cdot \tan x$

32. $f(x) = \dfrac{1}{2x - x^3}$

33. $f(x) = |x + 5| + x^3$

34. $f(x) = |2x + 1| + \sin x$

Tek Fonksiyonlar *(Odd Functions)*

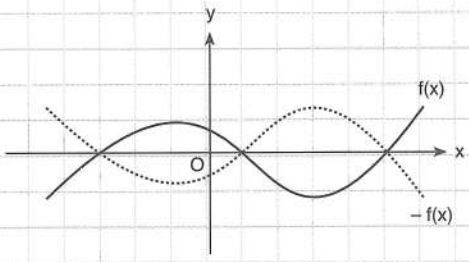
9 – 17 – 18 – 21 – 24 – 27 – 28 – 29 – 30 – 31 – 32

Çift Fonksiyonlar *(Even Functions)*

1 – 2 – 5 – 7 – 10 – 12 – 16 – 23 – 25

Pratik Grafik Çizme | Pratik Grafik Çizme

1.



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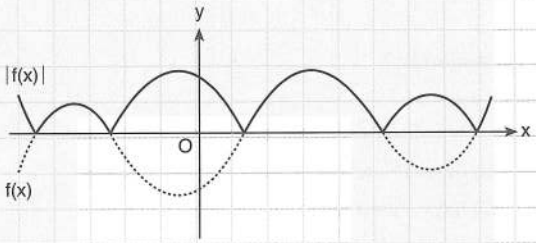
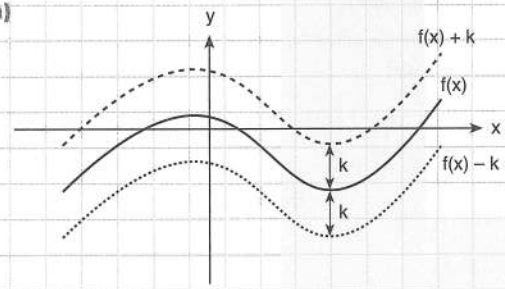


3. a)



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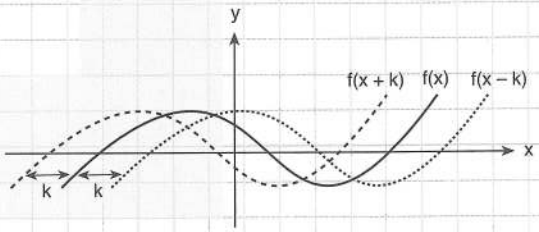

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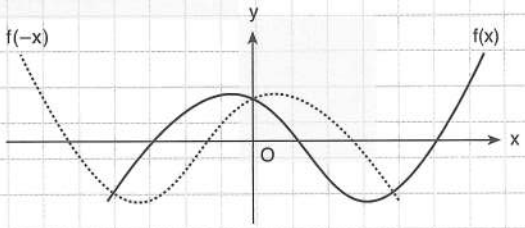

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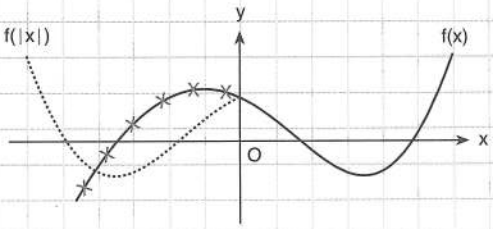


ÖZEL TANIMLI FONKSİYONLAR

TEST 1

1. Aşağıdakilerden hangisi çift fonksiyon değildir?
Which of the following is not a even function?

A) $f(x) = 4$ B) $f(x) = x^2 + 4$ C) $f(x) = x^6$

D) $f(x) = 5x^2 - 6$ E) $f(x) = 4x + 6$

2. Aşağıdakilerden hangisi tek fonksiyondur?
Which of the following is a odd function?

A) $f(x) = x^2 + 3$ B) $f(x) = x^5 - x^3$
C) $f(x) = 6x^3 - 2x^2$ D) $f(x) = 7x + 1$
E) $f(x) = 5x + 1$

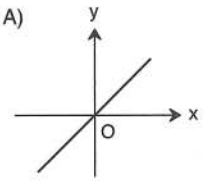
3. Aşağıdakilerden hangisi ne tek ne de çift fonksiyondur?
Which of the following function neither odd function or even function?

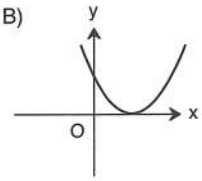
A) $f(x) = x^6 - 6$ B) $f(x) = 5x + 4$
C) $f(x) = x^5 - x$ D) $f(x) = 6$
E) $f(x) = 6x^2 - 7$

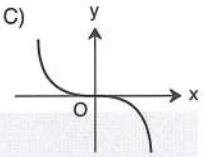
4. Aşağıdakilerden hangisi hem çift hem tek fonksiyondur?
Which of the following is both odd and even function?

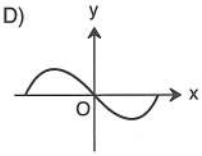
A) $f(x) = e^x$ B) $f(x) = x^4 - \frac{1}{4}$
C) $f(x) = 0$ D) $f(x) = 4x^6 + 1$
E) $f(x) = \sin^3 x + \cos^3 x$

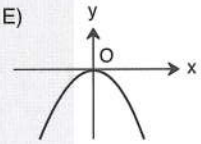
5. Aşağıdakilerden hangisi çift fonksiyonun grafiğidir?
Which of the following is the graph of even function?

A)


B)


C)


D)


E)


6. Aşağıdaki fonksiyonlardan hangisinin grafiği y–eksenine göre simetriktir?
Which of the following functions is the symmetrical according to the y–axis?

A) $f(x) = |x - 1|$ B) $f(x) = \tan x$
C) $f(x) = x^3 + 3x$ D) $f(x) = x^6 - x^2$
E) $f(x) = 6x + 4$

7. Aşağıda verilen fonksiyonlardan hangisinin grafiği y eksenine göre simetriktir?
Which of the following functions is the symmetrical according to the y–axis?

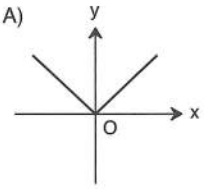
A) $f(x) = 3x^5 - 5x^2 + 1$ B) $f(x) = \sin x$
C) $f(x) = 6x^2 - 5x + 1$ D) $f(x) = x^5 - 5x$
E) $f(x) = 5x^2 + 1$

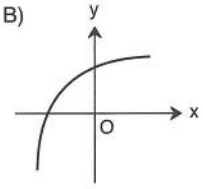
8. Aşağıda verilen fonksiyonlardan hangisinin grafiği orijine göre simetriktir?
Which of the following functions is the symmetrical according to the orijin?

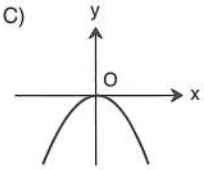
A) $f(x) = x^2$ B) $f(x) = \sin^3 x$
C) $f(x) = \cos x$ D) $f(x) = x^4 + \sin x$
E) $f(x) = x + 1$

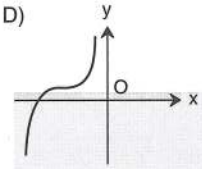
9. Aşağıdakilerden hangisi tek fonksiyonun grafiğidir?

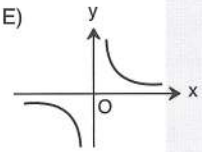
Which of the following is the graph of odd function?

A) 

B) 

C) 

D) 

E) 

10. $f(x) = (a-2)x^7 + (a+b-3)x^5 + 4x^2 - 6$

$f(x) = f(-x)$

$\Rightarrow b = ?$

A) -2 B) -1 C) 1 D) 3 E) 5

11. $f: R \to R$

$f(x) = f(-x)$

$f(-2) = k + 4$

$f(2) = 2k - 1$

$\Rightarrow k = ?$

A) 8 B) 7 C) 6 D) 5 E) 14

12. $2 \cdot f(x) + f(-x) = x^2 + k$

$f(x) = f(-x)$

$f(2) = 3$

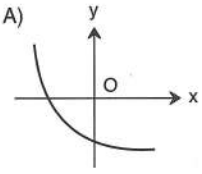
$\Rightarrow k = ?$

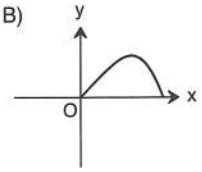
A) -1 B) 1 C) 3 D) 5 E) 6

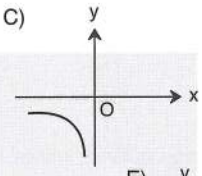
13. $f: R \to R$

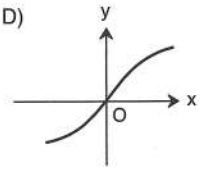
Aşağıdaki fonksiyonlardan hangisi $(0, \infty)$ aralığında artan fonksiyondur?

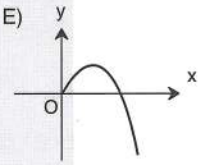
Which of the following is the increasing function in the range of $(0, \infty)$?

A) 

B) 

C) 

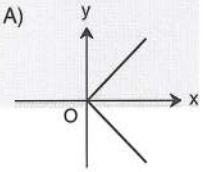
D) 

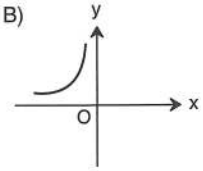
E) 

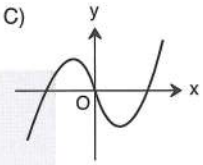
14. $f: R \to R$

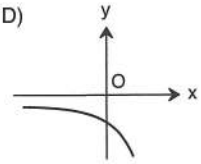
Aşağıdaki fonksiyonlardan hangisi azalan fonksiyondur?

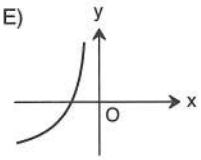
Which of the following is the decreasing function?

A) 

B) 

C) 

D) 

E) 

15. Aşağıdaki fonksiyonlardan hangisi $(-\infty, 0)$ aralığında artan fonksiyondur?

Which of the following is the increasing function in the range of $(-\infty, 0)$?

A) $f(x) = 3 - x$ B) $f(x) = \frac{2}{x}$

C) $f(x) = x^2 - 4x + 3$ D) $f(x) = 2\ln x$

E) $f(x) = 9 - x^2$

1. $f(x) = x^2 - 4$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(-2, 2)$ B) $(2, \infty)$ C) $(-\infty, -2)$
D) $(-3, 3)$ E) R

2. $f(x) = \dfrac{x-4}{x-2}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(2, \infty)$ B) $(-\infty, -2)$ C) R
D) $R \setminus \{1\}$ E) $R \setminus \{2\}$

3. $f(x) = \dfrac{x^2-9}{x^2-2x-3}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $R \setminus \{1\}$ B) $R \setminus \{-1, 5\}$ C) $(-1, 5)$
D) $R \setminus \{-1\}$ E) $R \setminus \{-1, 3\}$

4. $f(x) = \dfrac{2x-5}{x^2+x+4}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) R B) $R \setminus \{-4, 2\}$ C) $(-2, 4)$
D) $(-2, 1)$ E) $\varnothing$

5. $f: R \to R$

$f(x) = \dfrac{3x+1}{x^2-bx+b+3}$

$\Rightarrow$ b hangi aralıkta değer alır?
In which intervals "b" will have a value?

A) $(-6, 2)$ B) $(-2, 6)$ C) $(2, 6)$
D) $(-2, 4)$ E) $(1, 4)$

6. $f(x) = \sqrt[5]{x^2-2x-8}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(-2, 4)$ B) $(2, 4)$ C) R
D) $(-4, 2)$ E) $R \setminus \{-2, 4\}$

7. $f(x) = \sqrt{9-x^2}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(-3, 3)$ B) $[-3, 3]$ C) $[3, \infty)$
D) $(-\infty, 3)$ E) $\varnothing$

8. $f: A \to R$

$f(x) = \sqrt[8]{\dfrac{(x-2)^2}{4x-x^2}}$

A kümesindeki tam sayıların toplamı kaçtır?
What is the sum of the integer numbers of A set?

A) 14 B) 10 C) 6 D) 4 E) 2

9. $f(x) = \sqrt{9 - |x|}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(9, \infty)$ B) $(-\infty, -9)$ C) $(-9, 9)$
D) $[-9, 9]$ E) $(0, 9]$

10. $f(x) = \sqrt{6 - |2x - 4|}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(-1, 5]$ B) $[-1, 5]$ C) $[-1, \infty]$
D) $(-\infty, 5]$ E) $[5, \infty)$

11. $f(x) = \sqrt{\dfrac{x+4}{2 - |x-1|}}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $\varnothing$ B) R C) $(-1, \infty)$
D) $(2, \infty)$ E) $(-\infty, -4] \cup (-1, 3)$

12. $f(x) = \sqrt{-x^2 + 4x - 4}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) R B) $R \setminus \{2\}$ C) $\varnothing$
D) $(-2, 2)$ E) $\{2\}$

13. $f(x) = \log_2 (x - 4)$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(-\infty, 4)$ B) $(1, \infty)$ C) $(4, \infty)$
D) $(2, 4]$ E) $[4, \infty)$

14. $f(x) = \log (4x^2 - 16)$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(-2, \infty)$ B) $(2, \infty)$ C) $(-2, 2)$
D) $(-\infty, -2)$ E) $(-\infty, -2) \cup (2, \infty)$

15. $f(x) = \log_{(x-2)} (-x^2 + 4x + 5)$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(2, 5)$ B) $[2, 5]$ C) $(-1, 5)$
D) $(2, 5) \setminus \{3\}$ E) $[2, 5) \setminus \{3\}$

16. $f(x) = \log_{\sqrt{x^2 - 4x + 7}} |x - 6|$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the widest domain of f function in the reel numbers?

A) $(6, \infty)$ B) $[6, \infty)$ C) $(-6, 6)$
D) R E) $R \setminus \{6\}$

1. $f(x) = \begin{cases} 2 & x > 0 \\ 3 - x & x \leq 0 \end{cases}$

$\Rightarrow f(2) + f(-1) = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

2. $f(x) = \begin{cases} x - 1 & x > 3 \\ x^2 + 3 & x \leq 3 \end{cases}$

$\Rightarrow f(3) + f(4) = ?$

A) 19 B) 16 C) 15 D) 12 E) 10

3. $f(x - 3) = \begin{cases} \dfrac{x+4}{2} & x > 2 \\ x - 3 & x \leq 2 \end{cases}$

$\Rightarrow f(7) + f(1) = ?$

A) 13 B) 11 C) 10 D) 9 E) 7

4. $f(x + 1) = \begin{cases} x^2 - 1 & x \geq 1 \\ 3x & x < 1 \end{cases}$

$\Rightarrow f(1) + f(2) = ?$

A) -2 B) 0 C) 2 D) 3 E) 6

5. $f(3x-1) = \begin{cases} x + 1 & x > \dfrac{1}{3} \\ x^3 & x \leq \dfrac{1}{3} \end{cases}$

$\Rightarrow f(2) + f(-1) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

6. $f(x) = \begin{cases} x^2 - 1 & x \geq 3 \\ |x + 1| & x < 3 \end{cases}$

$g(x) = x + a$

$(f \cdot g)(2) = 15$

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

7. $f(x) = \begin{cases} x - 1 & x \geq 1 \\ x & x < 1 \end{cases}$

$g(x) = \begin{cases} x^2 & x \geq 2 \\ 4 & x < 2 \end{cases}$

$\Rightarrow (f + g)(3) = ?$

A) 12 B) 11 C) 9 D) 7 E) 6

8. $f(x) = \begin{cases} \dfrac{x-1}{2} & x > 0 \\ x - 1 & x \leq 0 \end{cases}$

$g(x) = \begin{cases} \dfrac{2}{x} & x > 1 \\ x & x \leq 1 \end{cases}$

$\Rightarrow (2f - g)(2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

9. $f(x)=\begin{cases}4 & x\geq 2\\ 2x-3 & x<2\end{cases}$

$g(x)=\begin{cases}3-x & x\geq 2\\ x+2 & x<2\end{cases}$

$\Rightarrow (f+g)(x)=?$

A) $(f+g)(x)=\begin{cases}6-x & x\geq 2\\ 3x-2 & x<2\end{cases}$

B) $(f+g)(x)=\begin{cases}7-x & x\leq 2\\ 2x-1 & x>2\end{cases}$

C) $(f+g)(x)=\begin{cases}7-x & x\geq 2\\ 3x-1 & x<2\end{cases}$

D) $(f+g)(x)=\begin{cases}3x-2 & x\geq 2\\ 6-x & x<2\end{cases}$

E) $(f+g)(x)=\begin{cases}7-x & x\geq 2\\ 2x-3 & x<2\end{cases}$

10. $f(x)=\begin{cases}3x-4 & x\geq 2\\ 4x & x<2\end{cases}$

$g(x)=\begin{cases}3-2x & x\geq 1\\ 2x^2 & x<1\end{cases}$

$\Rightarrow f(x)+g(x)=?$

A) $\begin{cases}x-1 & x\geq 2\\ 2x+3 & 1\leq x<2\\ 2x^2+4x & x<1\end{cases}$

B) $\begin{cases}5x-1 & x\geq 2\\ 2x^2+3x & 1\leq x<2\\ 4x+x^2 & x<1\end{cases}$

C) $\begin{cases}x-1 & x\geq 1\\ 4x-x^2 & x<1\end{cases}$

D) $\begin{cases}5x-1 & x\geq 2\\ x^2+2x & x<2\end{cases}$

E) $\begin{cases}5x-1 & x\geq 2\\ 2x+3 & 1\leq x<2\\ 4x-x^2 & x<1\end{cases}$

11. $f(x)=\begin{cases}3x+a & x>2\\ x+2 & x\leq 2\end{cases}$

$(fof)(2)=18$

$\Rightarrow a=?$

A) 5 B) 6 C) 7 D) 8 E) 9

12. $f(x)=\begin{cases}x^2+1 & x<2\\ 3x-1 & 2\leq x<4\\ 3+x & x>4\end{cases}$

$\Rightarrow (fofof)(-1)=?$

A) 8 B) 10 C) 12 D) 16 E) 20

13. $f(x)=\begin{cases}x+2 & x<0\\ 1-x & x\geq 0\end{cases}$

$g(x)=\begin{cases}x^2+1 & x\geq 1\\ x+4 & x<1\end{cases}$

$\Rightarrow (fog)(-1)+(gof)(-1)=?$

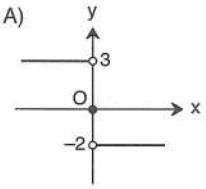
A) -2 B) -1 C) 0 D) 1 E) 2

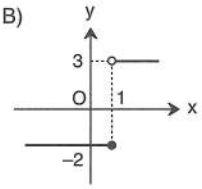
14. $f(x)=\begin{cases}x-6 & x\geq 0\\ -2+x & x<0\end{cases}$

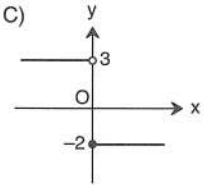
$\Rightarrow f^{-1}(-1)=?$

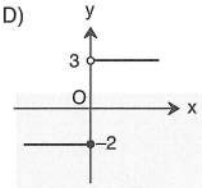
A) 5 B) 4 C) 3 D) 2 E) 1

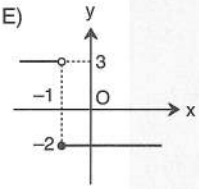
1. $f(x) = \begin{cases} 3 & x > 0 \\ -2 & x \leq 0 \end{cases}$ ⇒ graph of f(x) = ?

A)


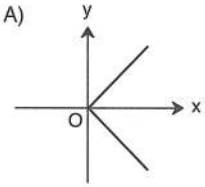
B)


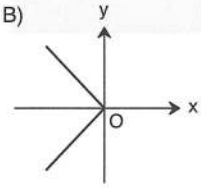
C)


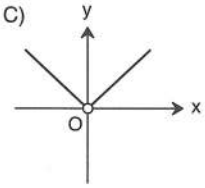
D)


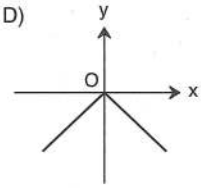
E)


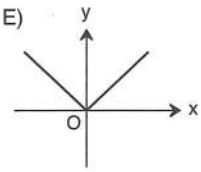
2. $f(x) = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$ ⇒ graph of f(x) = ?

A)


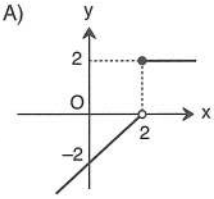
B)


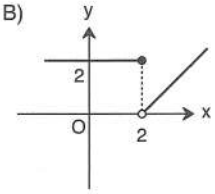
C)


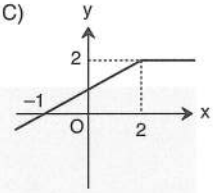
D)


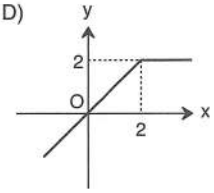
E)


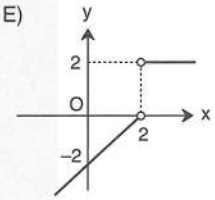
3. $f(x) = \begin{cases} 2 & x \geq 2 \\ x - 2 & x < 2 \end{cases}$ ⇒ graph of f(x) = ?

A)


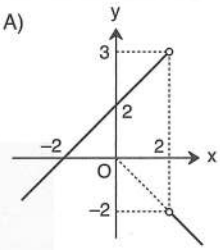
B)


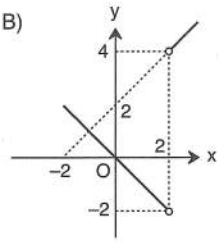
C)


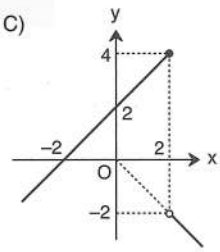
D)


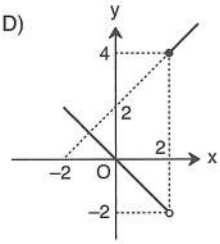
E)


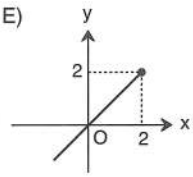
4. $f(x) = \begin{cases} x + 2 & x \geq 2 \\ -x & x < 2 \end{cases}$ ⇒ graph of f(x) = ?

A)


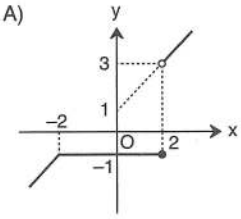
B)


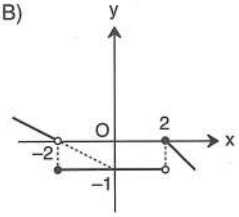
C)


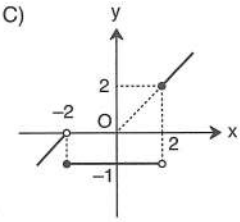
D)


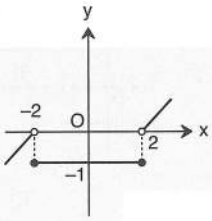
E)


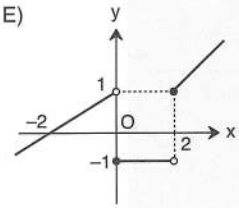
5. $f(x) = \begin{cases} x+2 & x < -2 \\ -1 & -2 \le x < 2 \\ x & x \ge 2 \end{cases}$ $\Rightarrow$ graph of $f(x) = ?$

A)


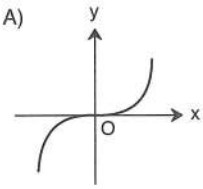
B)


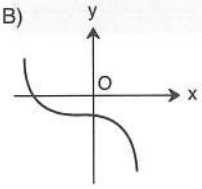
C)


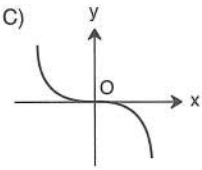
D)


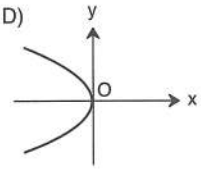
E)


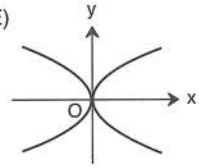
6. $f(x) = \begin{cases} x^4 & x \le 0 \\ -x^4 & x > 0 \end{cases}$ $\Rightarrow$ graph of $f(x) = ?$

A)


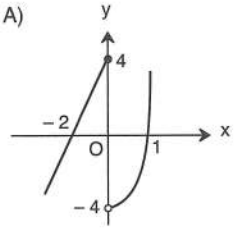
B)


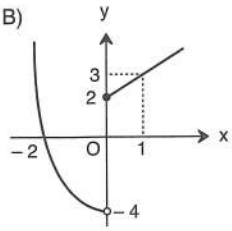
C)


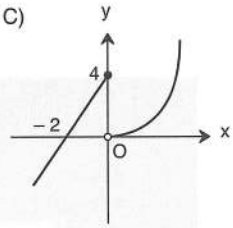
D)


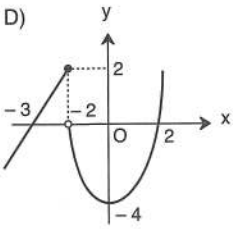
E)


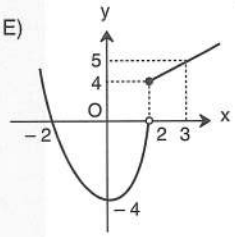
7. $f(x) = \begin{cases} x+2 & x \ge 0 \\ x^2-4 & x < 0 \end{cases}$ $\Rightarrow$ graph of $f(x) = ?$

A)


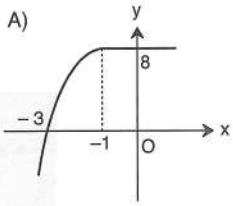
B)


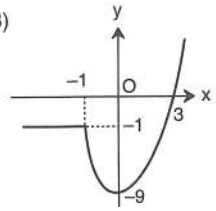
C)


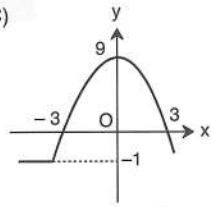
D)


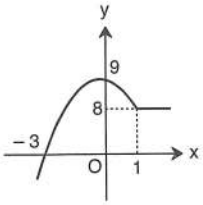
E)


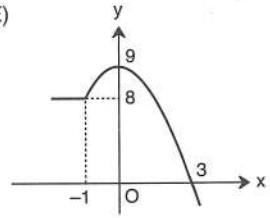
8. $f(x) = \begin{cases} 9-x^2 & x > -1 \\ 8 & x \le -1 \end{cases}$ $\Rightarrow$ graph of $f(x) = ?$

A)


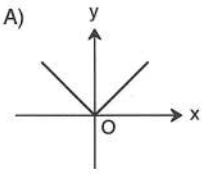
B)


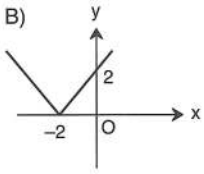
C)


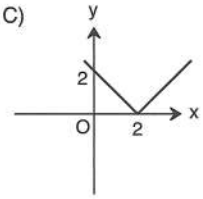
D)


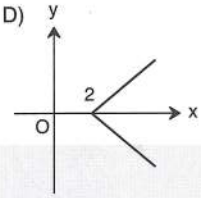
E)


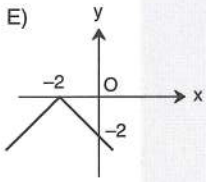
1. $f(x) = |x - 2|$ ⇒ graph of $f(x) = ?$

A)


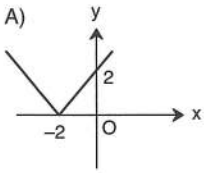
B)


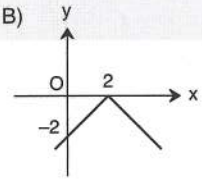
C)


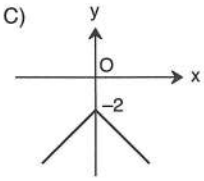
D)


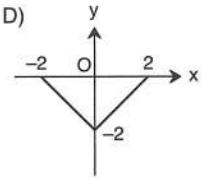
E)


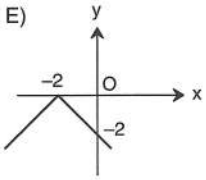
2. $f(x) = -|x + 2|$ ⇒ graph of $f(x) = ?$

A)


B)


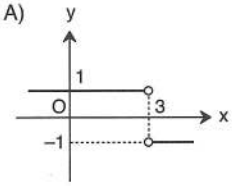
C)


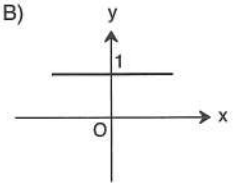
D)


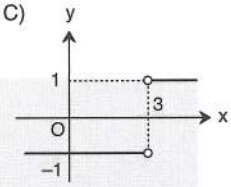
E)


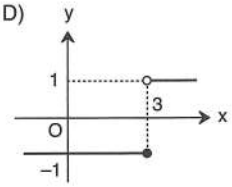
3. $f: R \setminus \{3\} \to R$

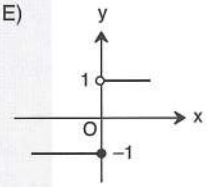
$f(x) = \dfrac{|x-3|}{x-3}$ ⇒ graph of $f(x) = ?$

A)


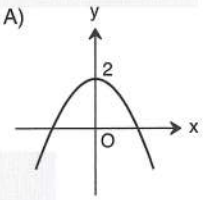
B)


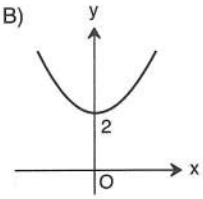
C)


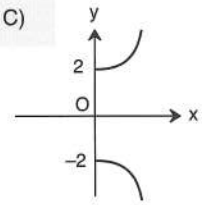
D)


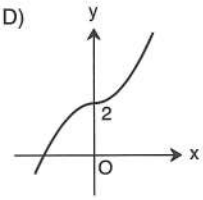
E)


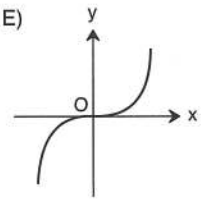
4. $f(x) = x \cdot |x| + 2$ ⇒ graph of $f(x) = ?$

A)


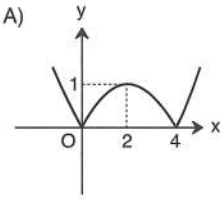
B)


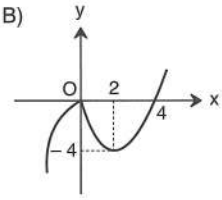
C)


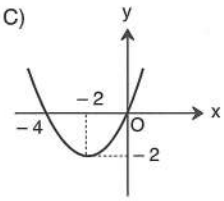
D)


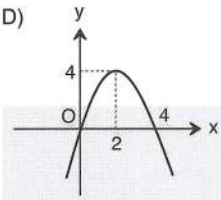
E)


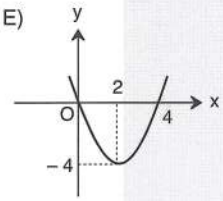
5. $f(x) = |x^2| - 4x$ ⇒ graph of f(x) = ?

A)


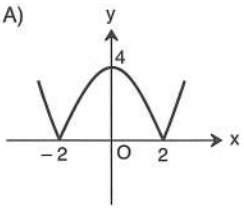
B)


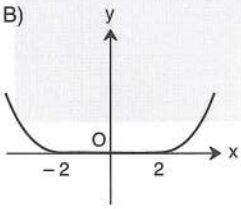
C)


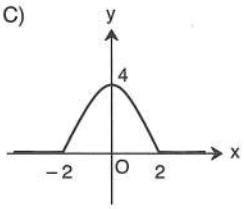
D)


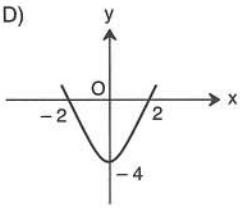
E)


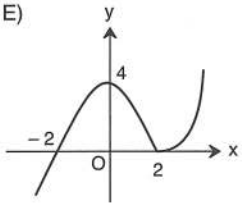
6. $f(x) = |4 - x^2|$ ⇒ graph of f(x) = ?

A)


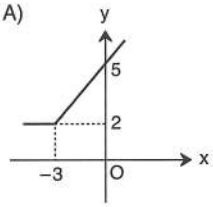
B)


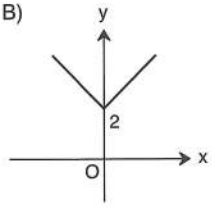
C)


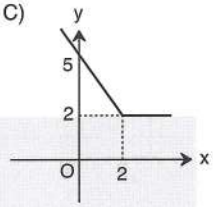
D)


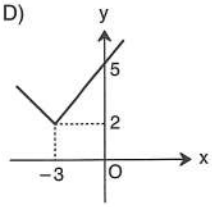
E)


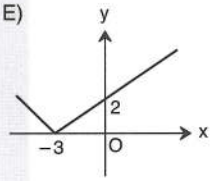
7. $f(x) = |x + 3| + 2$ ⇒ graph of f(x) = ?

A)


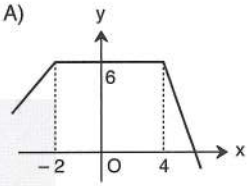
B)


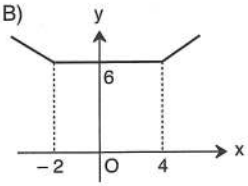
C)


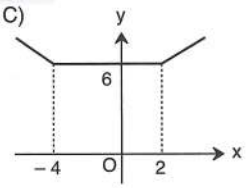
D)


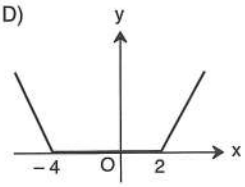
E)


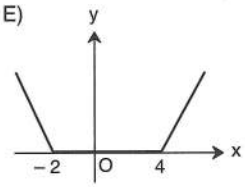
8. $f(x) = |x - 4| + |x + 2|$ ⇒ graph of f(x) = ?

A)


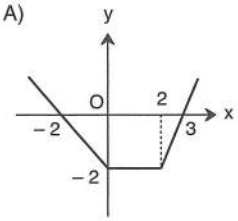
B)


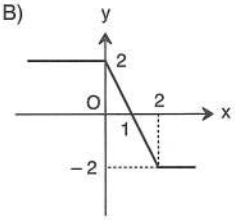
C)


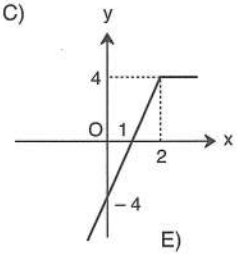
D)


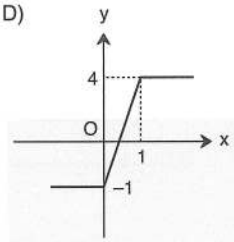
E)


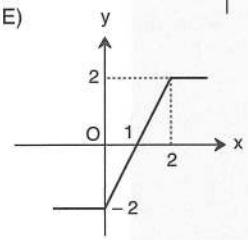
1. $f(x) = |x| - |x-2|$ $\Rightarrow$ graph of $f(x) = ?$

A)


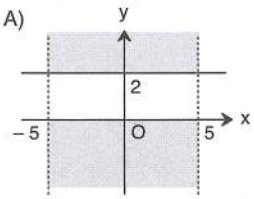
B)


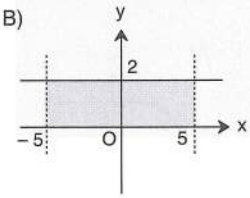
C)


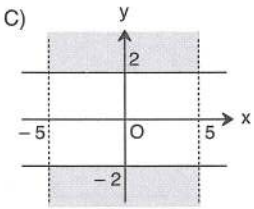
D)


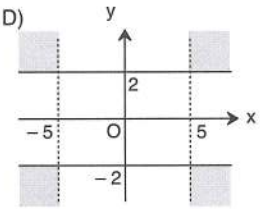
E)


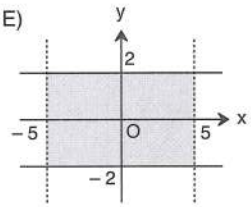
2. $A = \{(x, y) : |x| < 5,\ |y| \le 2 \quad x, y \in R\}$ $\Rightarrow A = ?$

A)


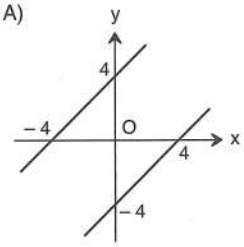
B)


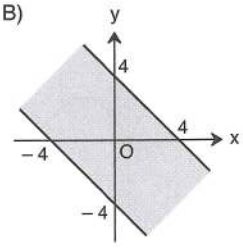
C)


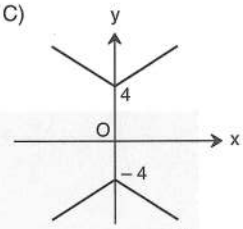
D)


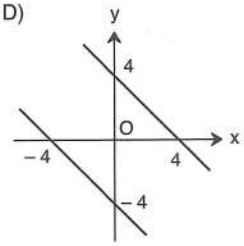
E)


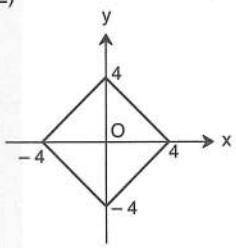
3. $y = f(x)$ $\quad |x + y| = 4$ $\Rightarrow$ graph of $f(x) = ?$

A)


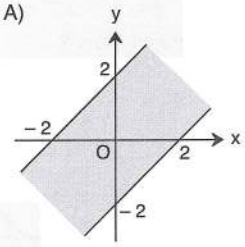
B)


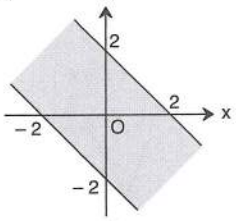
C)


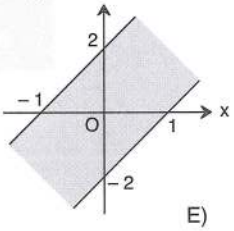
D)


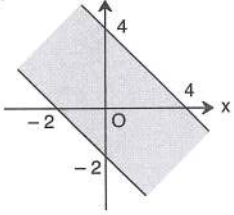
E)


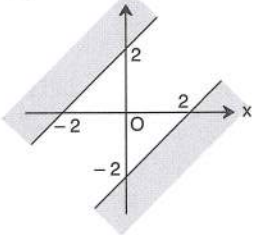
4. $y = f(x)$ $\quad |x - y| \le 2$ $\Rightarrow$ graph of $f(x) = ?$

A)


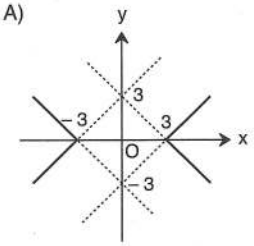
B)


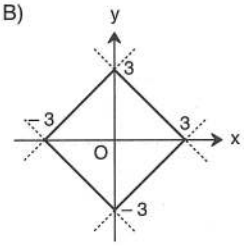
C)


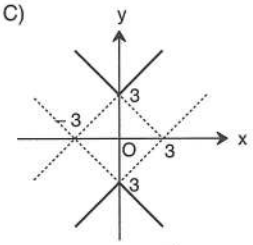
D)


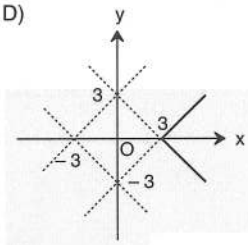
E)


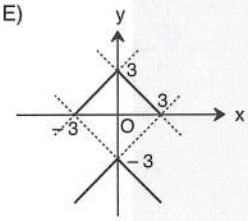
5. $y = f(x)$ $\quad |x| - |y| = 3$ $\quad \Rightarrow$ graph of $f(x) = ?$

A)


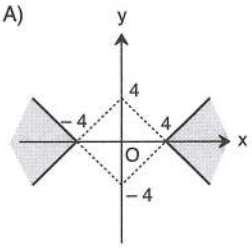
B)


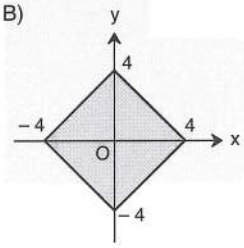
C)


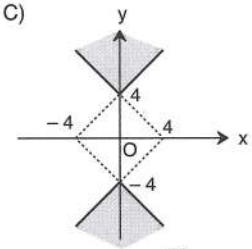
D)


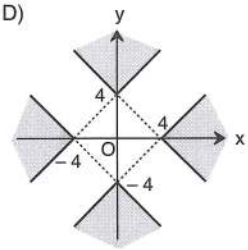
E)


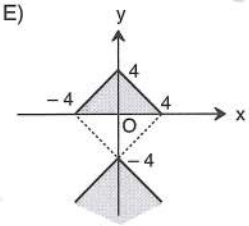
6. $y = f(x)$ $\quad |x| + |y| \leq 4$ $\quad \Rightarrow$ graph of $f(x) = ?$

A)


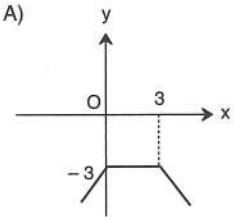
B)


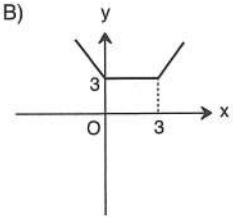
C)


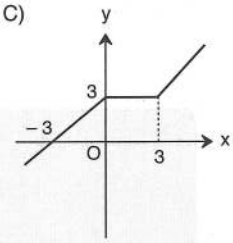
D)


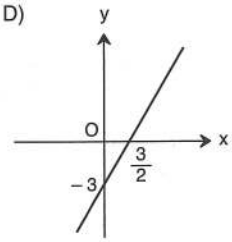
E)


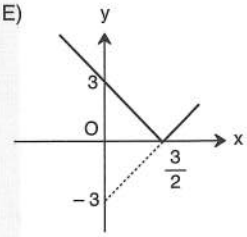
7. $f(x) = |x| + |x - 3|$ $\quad \Rightarrow$ graph of $f(x) = ?$

A)


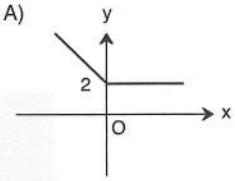
B)


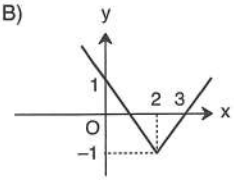
C)


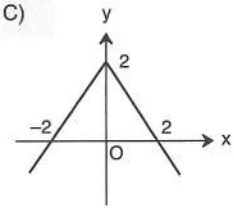
D)


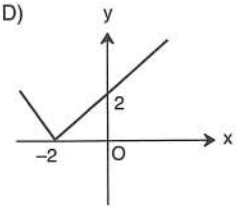
E)


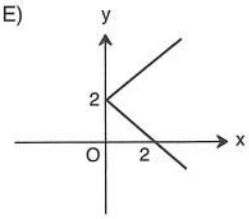
8. $f(x) = |x - 2| - 1$ $\quad \Rightarrow$ graph of $f(x) = ?$

A)


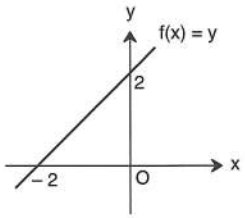
B)


C)


D)


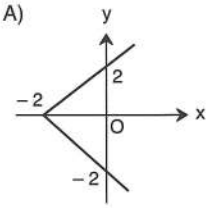
E)


1.

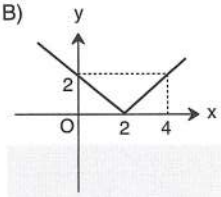


⇒ graph of $|f(x)| = ?$

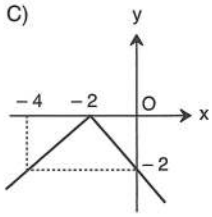
A)



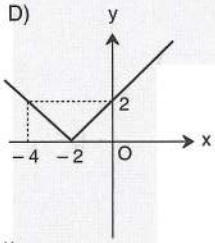
B)



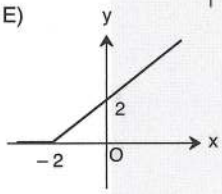
C)



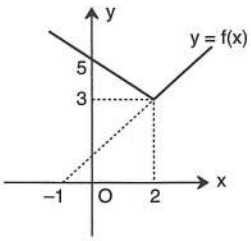
D)



E)



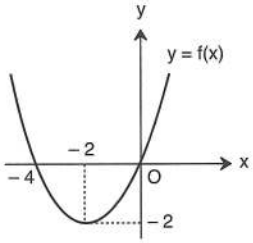
2.



⇒ $f(x) = ?$

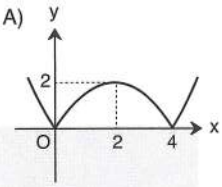
A) $y = |x-2| + x$
B) $y = |x-2| - x$
C) $y = |2-x| + 2$
D) $y = |2-x| + 3$
E) $y = |x-2| + 1$

3.

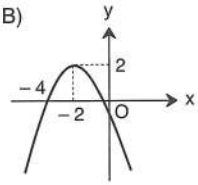


⇒ graph of $|f(x)| = ?$

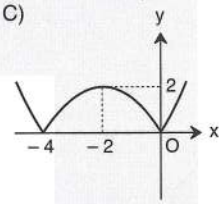
A)



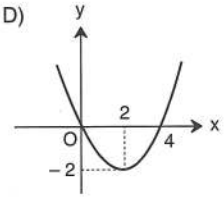
B)



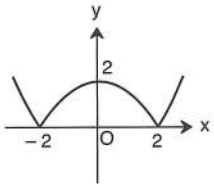
C)



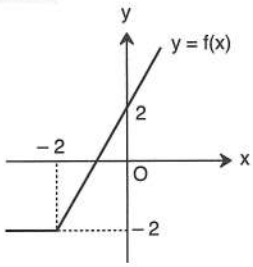
D)



E)



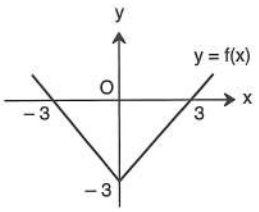
4.

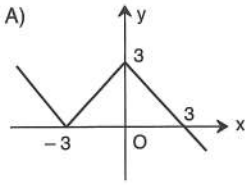


⇒ $y = f(x) = ?$

A) $y = |x+2| + x$
B) $y = |x+2| + 4$
C) $y = |x+4| - 4$
D) $y = |2+x| - x$
E) $y = |x| + 2$

5. ⇒ graph of $(-|f(x)|) = ?$



A)


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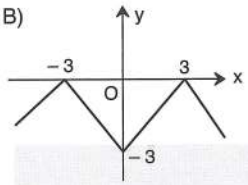
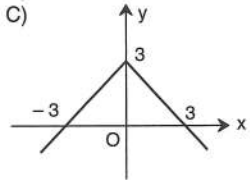
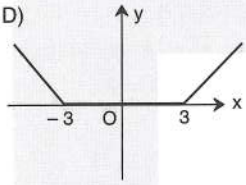
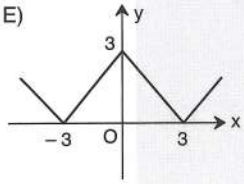
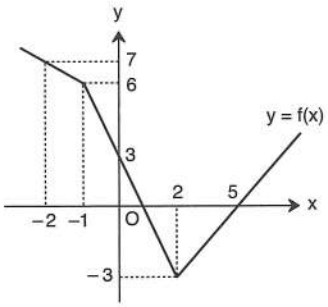


C)


D)


E)


6. ⇒ $f(x) = ?$

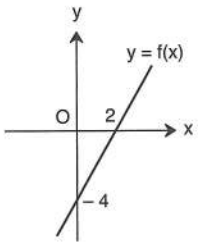


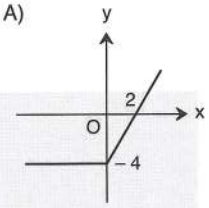
A) $y = 2|x-2| - |x+1|$ B) $y = |x-1| - 2|x-2|$

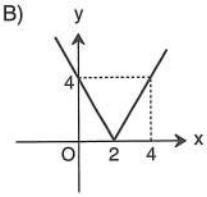
C) $y = |x-2| - |x+1|$ D) $y = 2|x-2| + |x+1|$

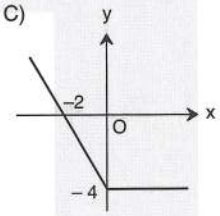
E) $y = |x+1| - |x-2|$

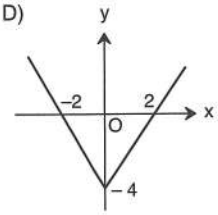
7. ⇒ graph of $f(|x|) = ?$

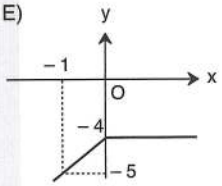


A)


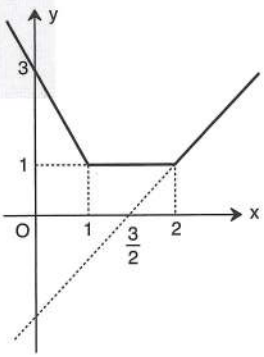
B)


C)


D)


E)


8. ⇒ $y = f(x) = ?$



A) $y = |x| + |x-2|$ B) $y = |x-1| - |x-2|$

C) $y = |x-2| - |x|$ D) $y = |x-1| + |x-2|$

E) $y = |x| + |x+2|$

1. $x, y \in R$

$\text{sgn}(2x + y) + \text{sgn}(x \cdot y) = 2$

$\Rightarrow \text{sgn}(x + 3) + \text{sgn}(y + 2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

2. $x \in R$

$f(x) = \text{sgn}^2(x - 2) + |x + 3|$

$\Rightarrow f(-2) = ?$

A) 3 B) 2 C) 1 D) -1 E) -2

3. $x \in R$

$\Rightarrow f(x) = \text{sgn}[\text{sgn}(x^2 + 4) + x^2 + 3] = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

4. $x \in Z$

$\text{sgn}(2 - x) + \text{sgn}(x - 4) < 0$

$\Rightarrow \sum x = ?$

A) 4 B) 5 C) 6 D) 7 E) 9

5. $x \in Z$

$\text{sgn}(|x + 2| - 3) = -1$

$\Rightarrow \sum x = ?$

A) -12 B) -11 C) -10 D) -9 E) -8

6. $x \in R$

$x^2 + |1 - x| = \text{sgn}(1 - x)$

$\Rightarrow$ S.S. = ?

A) $\{-1, 0, 1\}$ B) $\{-1\}$ C) $\{0\}$ D) $\{-1, 0\}$ E) $\emptyset$

7. $x \in R$

$\text{sgn}(25 - x^2) = 0$

$\Rightarrow$ S.S. = ?

A) $(5, \infty)$ B) $(-5, \infty)$ C) $(-5, 5)$ D) $\{-5, 5\}$ E) $\emptyset$

8. $-2 < x < 0$

$f(x) = \text{sgn}(x - 3) + |x + 12|$

$\Rightarrow f(x) = ?$

A) $x + 2$ B) $x + 11$ C) $-x$ D) $-x - 1$ E) $-x - 2$

9. $x \in R$

$\text{sgn}(x+6) \cdot \text{sgn}(3-x) = 1$

$\Rightarrow$ S.S. = ?

A) $(-3, 6)$ B) $(-\infty, -6)$ C) $[-6, 3)$ D) $(3, \infty)$ E) $(-6, 3)$

10. $0 < x < \pi$

$\text{sgn}(\sin x) = 1$

$\Rightarrow$ S.S. = ?

A) $\left(0, \frac{\pi}{4}\right)$ B) $(0, \pi)$ C) $\left(0, \frac{\pi}{2}\right)$ D) $\left(\frac{\pi}{2}, \pi\right)$ E) $\left(\frac{2\pi}{3}, \frac{\pi}{2}\right)$

11. $x \in R$

$\text{sgn}(x^2+5) + \text{sgn}(x^2+4x+6) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

12. $x \in Z$

$\text{sgn}(x-3) = |x-4|$

$\Rightarrow \sum x = ?$

A) 5 B) 6 C) 7 D) 8 E) 9

13. $f(x) = \begin{cases} \text{sgn}(x-5) & x > 4 \\ \text{sgn}\left(\frac{x^2-4}{x+1}\right) & x \le 4 \end{cases}$

$\Rightarrow f(5) + f(2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

14. $x \in R$

$\text{sgn}(x^2-3x+3) = \text{sgn}\left(\frac{x-5}{1-x}\right)$

$\Rightarrow$ S.S. = ?

A) $(2, 5)$ B) $(1, 5]$ C) $(-1, 1)$ D) $(-2, 4)$ E) $(1, 5)$

15. $m, n \in R$

$m \cdot n < 0$

$\Rightarrow \text{sgn}\left(\frac{m}{n}\right) + \text{sgn}(m \cdot n) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

16. $f(x) = |x+4| + \text{sgn}(3-x)$

$\Rightarrow f(-7) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

1. $x \in Z$

$\left\lceil \frac{x}{3} - 1 \right\rceil = 2$

$\Rightarrow \sum x = ?$

A) 30 B) 40 C) 45 D) 52 E) 55

2. $\lceil x^2 - 4x \rceil = -4$

Denklemini sağlayan kaç tane tam sayı vardır?

How many elements of set of solution of the equation?

A) 1 B) 2 C) 3 D) 4 E) 5

3. $x \in R$

$\lceil 2x - 3 \rceil = 5$

$\Rightarrow$ S.S. = ?

A) $\left[4, \frac{9}{2}\right)$ B) $\left(4, \frac{9}{2}\right)$ C) $\left(4, \frac{9}{2}\right]$

D) $\left(3, \frac{9}{2}\right)$ E) $\left[3, \frac{9}{2}\right)$

4. $x \in R$

$\left\lceil \lceil x - 1 \rceil + 4 \right\rceil = \left\lceil \frac{15}{2} \right\rceil$

$\Rightarrow$ S.S. = ?

A) [2, 3) B) [3, 4) C) [4, 5)

E) [5, 6) E) [6, 7)

5. $x \in R$

$\lceil (\log_2 x) + 1 \rceil + \lceil (\log_2 x) + 2 \rceil = 9$

$\Rightarrow$ S.S. = ?

A) [8, 16) B) [6, 8) C) [3, 4)

D) [4, 8) E) [9, 16)

6. $a \in Z$

$f(x) = \left\lceil \frac{x^2 + x + a + 1}{3} \right\rceil$

$f(1) = -2$

$\Rightarrow \sum a = ?$

A) – 25 B) – 24 C) – 22 D) – 20 E) – 19

7. $x \in R$

$\lceil x - 1 \rceil = \text{sgn}(x - 2) + 2$

$\Rightarrow$ S.S. = ?

A) [3, 4) B) [4, 5) C) [5, 6)

D) [6, 7) E) [7, 8)

8. $x \in R$

$\lceil x - 4 \rceil \leq 4$

$\Rightarrow$ S.S. = ?

A) $[9, \infty)$ B) $[-9, \infty)$ C) $(-9, \infty)$

D) $(-\infty, 9)$ E) $(-\infty, 9]$

9. $f(x) = x^2 - \left[\!\left[\frac{6}{x}\right]\!\right]$

$\Rightarrow f(4) = ?$

A) 16 B) 15 C) 14 D) 13 E) 12

10. $\left[\!\left[\frac{x}{4} + \frac{1}{4}\right]\!\right] = \frac{5}{4}$

$\Rightarrow$ S.S. = ?

A) {1} B) {4} C) {1, 4} D) Ø E) IR

11. $x \in R$

$[\![x-2]\!] + [\![x+2]\!] = 4$

$\Rightarrow$ S.S. = ?

A) [4, 5) B) [– 3, – 2) C) [1, 2) D) [2, 3) E) [3, 4)

12. $x \in R$

$[\![x+1]\!] + \left[\!\left[\frac{2x-8}{2}\right]\!\right] = 5$

$\Rightarrow$ S.S. = ?

A) (3, 4) B) [4, 5) C) [2, 3) D) [0, 1) E) $\left[3, \frac{7}{2}\right)$

13. $x \in R$

$[\![[\![2x+3]\!] + [\![2x]\!] - 4]\!] = 8$

$\Rightarrow$ S.S. = ?

A) R B) Ø C) [4, 9) D) $\left\{\frac{9}{2}\right\}$ E) [2, 4)

14. $[\![x + 2 + [\![x]\!]]\!] = 10$

$\Rightarrow$ S.S. = ?

A) [0, 2) B) [1, 3) C) [2, 4) D) [3, 4) E) [4, 5)

15. $[\![4\sqrt{2} - 3]\!] + [\![8 - 4\sqrt{2}]\!] = ?$

A) 9 B) 6 C) $4\sqrt{2}$ D) 5 E) 4

16. $3 < x < 4$

$f(x) = [\![x - |x+2|]\!] + |x-2|$

$\Rightarrow f(x) = ?$

A) $x - 4$ B) x C) $x + 2$ D) $2x - 4$ E) $2x - 6$

1. $f(x) = \dfrac{3x}{|x-2|}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the domain of f function in the reel numbers?

A) R B) $[3, +\infty)$ C) $(-\infty, 2)$ D) $(-\infty, 2]$ E) $R \setminus \{2\}$

2. $f(x) = \sqrt{3-|x|}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the domain of f function in the reel numbers?

A) $R \setminus \{3\}$ B) $[-3, 3]$ C) $(-3, 3)$ D) $[0, \infty)$ E) $(-\infty, 3]$

3. $f(x) = \begin{cases} 1+x^2 & x \geq 3 \\ 2x+3 & 0 < x < 3 \\ 2-3x & x \leq 0 \end{cases}$

$\Rightarrow (fofof)(0) = ?$

A) 50 B) 26 C) 17 D) 10 E) 5

4. $f(x) = \dfrac{x^2-9}{x^3-9x}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the domain of f function in the reel numbers?

A) R B) $R \setminus \{-3, 3\}$ C) $\{-3, 3\}$ D) $R \setminus \{-3, 0, 3\}$ E) $\{-3, 0, 3\}$

5. $|2x-5| = 9$
$\Rightarrow$ S.S. = ?

A) $\{-2\}$ B) $\{-2, 7\}$ C) $\{-4, 2\}$ D) $\{-2, 2\}$ E) $\{2\}$

6. $f(x) = \begin{cases} x^2+1 & x \leq 3 \\ 3x-2 & x > 3 \end{cases}$
$\Rightarrow f(1) + f(5) = ?$

A) 3 B) 9 C) 10 D) 15 E) 19

7. $f(x) = \sqrt{6-|x-1|}$

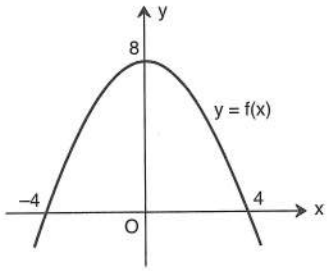
f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?
What is the domain of f function in the reel numbers?

A) $[-2, 7]$ B) $[-5, 7]$ C) $[-2, 7)$ D) $[-4, 6]$ E) $[-3, 6]$

8. $f(x) = |x+4| - |x+1|$
$\Rightarrow f(1) + f(3) = ?$

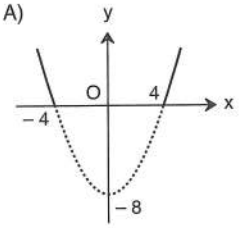
A) 5 B) 6 C) 7 D) 8 E) 9

9.

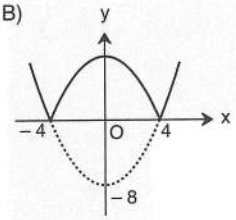


$\Rightarrow \text{graf}\left(\frac{1}{2}\left[\left|f(x)\right|+f(x)\right]\right) = ?$

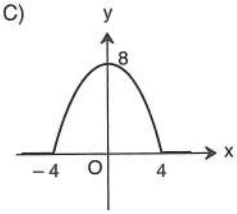
A)



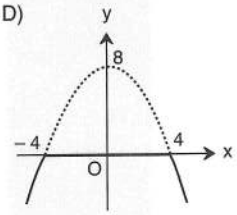
B)



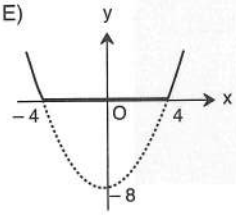
C)



D)



E)



10. $f(x) = \sqrt{\frac{1}{x} - \frac{1}{x-4}}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?

What is the domain of f function in the reel numbers?

A) (0, 5) B) (0, 4) C) (1, 4] D) (– 4, 0) E) (4, ∞)

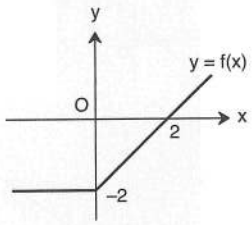
11. $f(x) = \sqrt{\frac{3-|x|}{3+|x|}}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?

What is the domain of f function in the reel numbers?

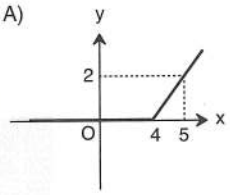
A) (– 3, ∞) B) (– ∞, 3) C) [– 3, 3] D) (– 3, 3) E) R \ (– 3, 3)

12.

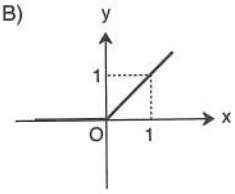


$\Rightarrow \text{graf}\left(\left|f(x)\right|+f(x)\right) = ?$

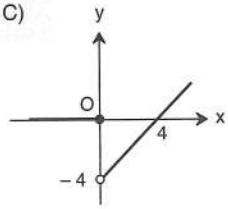
A)



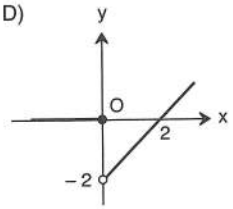
B)



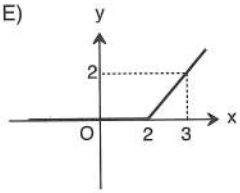
C)



D)



E)



1. $f(x) = \begin{cases} x^2+1 & x<3 \\ x+5 & x \geq 3 \end{cases}$

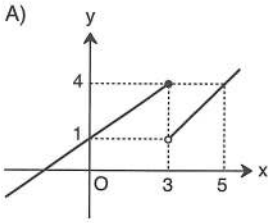
$\Rightarrow (fof)(2) = ?$

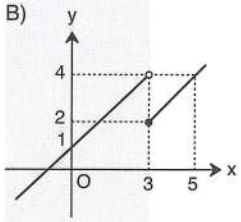
A) 4 B) 6 C) 8 D) 10 E) 12

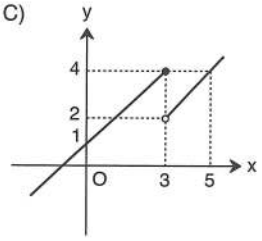
2. $f(x) = \begin{cases} x+1 & x<3 \\ x-1 & x \geq 3 \end{cases}$

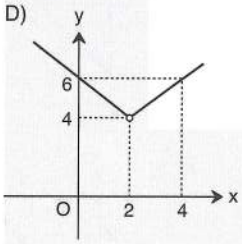
Parçalı fonksiyonunun grafiği aşağıdakilerden hangisidir?

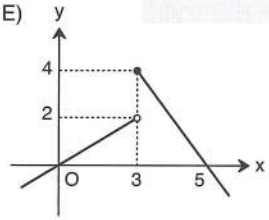
Which of the following is the graph of the piecewise function?

A)


B)


C)


D)


E)


3. $|(\log_2 x) - 2| = 2$

$\Rightarrow \prod x = ?$

A) 2^9 B) 2^8 C) 2^7 D) 2^6 E) 2^4

4. $f(x) = x^2 - \text{sgn}(x-3) + |x-2|$

$\Rightarrow f(3) = ?$

A) 11 B) 10 C) 9 D) 8 E) 7

5. $x \in Z$

$[\![2x-4]\!] \leq -11$

$\Rightarrow \max(x) = ?$

A) -5 B) -4 C) -3 D) -2 E) -1

6. $x \in R$

$[\![x+1]\!] = \text{sgn}(x-1)$

$\Rightarrow$ S.S. = ?

A) $(-1, 2)$ B) $[-2, 2)$ C) $[-2, -1)$ D) $(-1, 0)$ E) $[0, 1]$

7. $x \in R$

$[\![2x-5]\!] = 5$

$\Rightarrow$ S.S. = ?

A) $\left[\frac{11}{2}, 6\right)$ B) $\left(\frac{11}{2}, 6\right]$ C) $\left(5, \frac{11}{2}\right]$ D) $\left[5, \frac{11}{2}\right)$ E) $\left(5, \frac{11}{2}\right)$

8. $\text{sgn}\left(\log_{\frac{1}{3}} 8\right) + \text{sgn}\left(\log_8 \frac{1}{3}\right) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

9. $x \in R$

$|2x-4| \cdot [\![x]\!] = 0$

$\Rightarrow$ S.S. = ?

A) $[0, 1)$ B) $[0, 1) \cup \{2\}$ C) $[0, 2)$ D) $[-1, 0)$ E) $[-1, 0) \cup \{2\}$

10. $x \in R$

$|x-1| = 4 + \text{sgn}(x-6)$

Denkleminin çözüm kümesi kaç elemanlıdır?

How many elements are in set of solution of the equation?

A) 0 B) 1 C) 2 D) 3 E) 4

11. $x \in R$

$\text{sgn}(\ln x) - 1 = 0$

$\Rightarrow$ S.S. = ?

A) $(1, e)$ B) $(1, \infty)$ C) $(0, e)$ D) $(0, 1)$ E) $(1, 3)$

12. $f(x) = |x+1|$

$g(x) = \left[\!\left[\dfrac{x-1}{2}\right]\!\right]$

$h(x) = \text{sgn}(2x-3)$

$\Rightarrow (fogoh)(-2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

13. $f(x) = \dfrac{\sqrt{x^2-4x+4}}{\sqrt{x+2}}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?

What is the domain of f function in the real numbers?

A) $(-2, \infty)$ B) $(-2, 2)$ C) $(-2, 0)$ D) $(-2, 4)$ E) $[-2, \infty)$

14. $|x-2| + |2-x| = 6$

$\Rightarrow \sum x = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

15. $f(x) = \dfrac{\ln(-x^2+5x)}{\sqrt{x-2}}$

f fonksiyonunun reel sayılarda en geniş tanım kümesi nedir?

What is the domain of f function in the real numbers?

A) $(-2, 2)$ B) $(-1, 5)$ C) $(0, 5)$ D) $(2, 5)$ E) $[1, 5]$

16. $x \in R$

$4 < [\![3x-4]\!] < 6$

$\Rightarrow$ S.S. = ?

A) $[5, 7)$ B) $(3, 5)$ C) $[3, 7)$ D) $\left[3, \dfrac{10}{3}\right)$ E) $[3, 4)$

ÖZEL TANIMLI FONKSİYONLAR
SPECIAL-DEFINED FUNCTIONS

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
E	B	B	C	E	D	E	B	E	C	D	D	D	D	E

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	E	E	A	B	C	B	C	D	B	E	E	C	E	D	E

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14
D	C	B	B	E	C	B	C	C	A	B	A	C	A

TEST 4

1	2	3	4	5	6	7	8
D	E	A	D	C	C	B	E

TEST 5

1	2	3	4	5	6	7	8
C	E	C	D	E	A	D	B

TEST 6

1	2	3	4	5	6	7	8
E	E	D	A	A	B	B	B

TEST 7

1	2	3	4	5	6	7	8
D	D	C	A	B	A	D	D

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	B	D	E	C	C	D	B	E	B	E	A	C	E	A	D

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	A	A	C	A	B	B	D	B	D	D	B	B	E	E	A

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12
E	B	A	D	B	D	B	B	C	B	C	E

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	E	B	B	C	D	A	B	C	B	C	A	D	D	D

LİMİT

LIMIT

LİMİT

TANIM | Definition

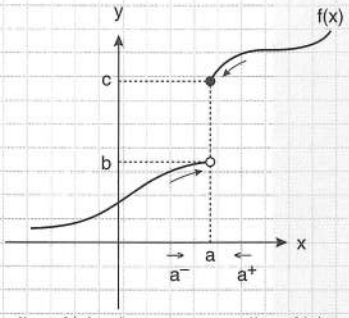
$\lim\limits_{x \to a^+} f(x)$: f(x) fonksiyonunun a noktasındaki sağdan limiti
right-hand limit on 'a' point of f(x)function

$\lim\limits_{x \to a^-} f(x)$: f(x) fonksiyonunun a noktasındaki soldan limiti
left-hand limit on 'a' point of f(x) function

$\lim\limits_{x \to a} f(x)$: f(x) fonksiyonunun a noktasındaki limiti
limit on 'a' point of f(x) function

- Bir fonksiyonun bir noktada limitinin olabilmesi için o noktadaki sağ ve sol limitlerinin eşit olması gerekir.
  For a function to have a limit on a point right-hand and left-hand limit should be equal

- $\lim\limits_{x \to a} f(x) = f(a)$ ise f fonksiyonu a noktasında süreklidir.
  If $\lim\limits_{x \to a} f(x) = f(a)$ *function is continuous on a point.*

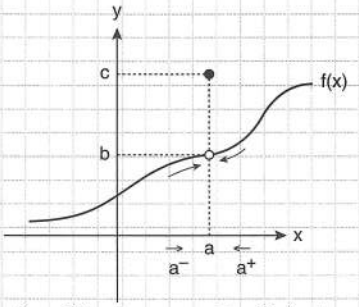
- 

$\lim\limits_{x \to a^-} f(x) = b$ $\qquad$ $\lim\limits_{x \to a^+} f(x) = c$

$\lim\limits_{x \to a^+} f(x) \neq \lim\limits_{x \to a^-} f(x)$

$\lim\limits_{x \to a} f(x)$ limiti yoktur. *(there is no limit)* $\quad f(a) = c$

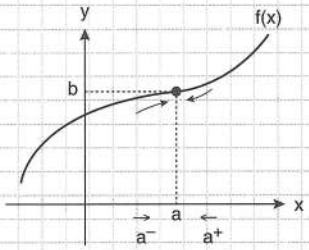
f(x) fonksiyonu a noktasında süreksiz.
f(x) is a discountinuous function on the a point

- 

$\lim\limits_{x \to a^-} f(x) = b$ $\qquad$ $\lim\limits_{x \to a^+} f(x) = b$

$\lim\limits_{x \to a} f(x) = b$

f(a) = c olduğundan f(x) fonksiyonu a noktasında süreksizdir.
As f(a) = c, f(x) function is discountinuous on a point.

- 

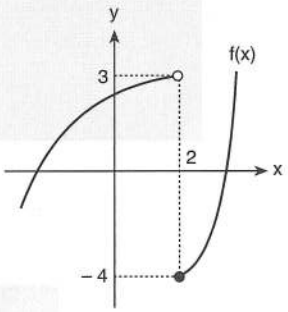
$\lim\limits_{x \to a^-} f(x) = b$ $\qquad$ $\lim\limits_{x \to a^+} f(x) = b$

$\lim\limits_{x \to a} f(x) = b$

f(a) = b olduğundan f(x) fonksiyonu a noktasında süreklidir.
As f(a) = b, f(x) function is continuous on a point.

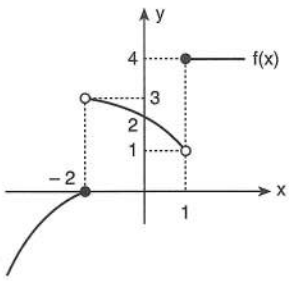
> Bir fonksiyon sürekli ise sağ ve sol limiti incelemeye gerek kalmaz. Limit görüntüye eşittir.
> *If a function is continuous there is no need to analyse the left-hand and right-hand limit. Limit is equal to the image.*

1.



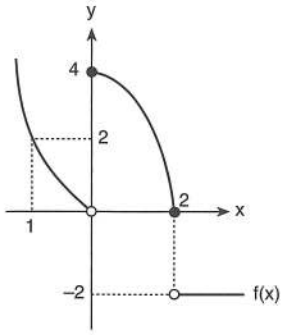
$\Rightarrow \lim\limits_{x \to 2^+} f(x) + \lim\limits_{x \to 2^-} f(x) = ?$ $\qquad$ **–1**

2.



$\Rightarrow \lim\limits_{x \to -2^+} f(x) + \lim\limits_{x \to 1^-} f(x) = ?$ $\qquad$ **4**

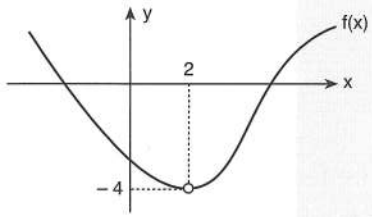
3.



$\Rightarrow \lim\limits_{x \to 2^+} f(x) + \lim\limits_{x \to 0^+} f(x) = ?$

2

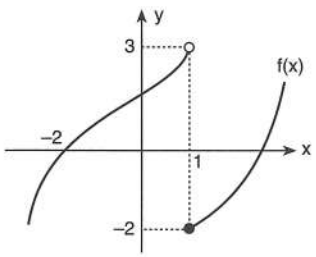
4.



$\Rightarrow \lim\limits_{x \to 2} f(x) = ?$

– 4

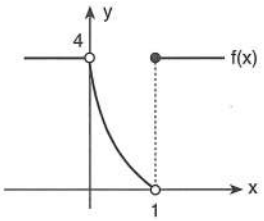
5.



$\Rightarrow \lim\limits_{x \to 1} f(x) = ?$

Ø

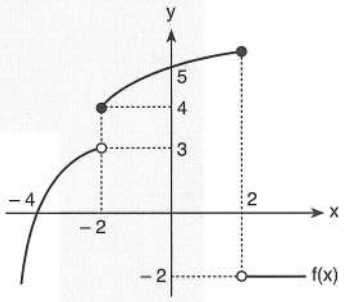
6.



$\Rightarrow \lim\limits_{x \to 0^+} f(x) + \lim\limits_{x \to 1^-} f(x) = ?$

4

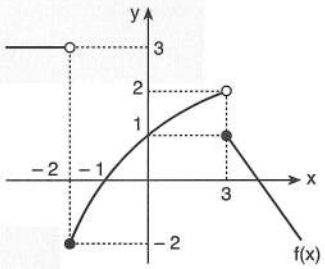
7.



$\Rightarrow \lim\limits_{x \to -2^-} f(x) + \lim\limits_{x \to 0} f(x) + \lim\limits_{x \to 2^+} f(x) = ?$

6

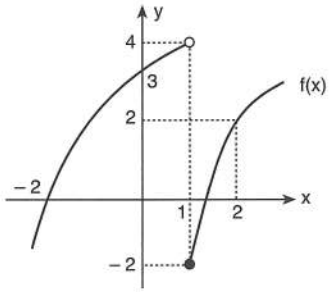
8.



$\Rightarrow \lim\limits_{x \to 0} f(x) + \lim\limits_{x \to 3^+} f(x) + \lim\limits_{x \to -2^-} f(x) = ?$

5

9.



$\lim\limits_{x \to 2} f(x) + \lim\limits_{x \to 1^-} f(x) = ?$

6

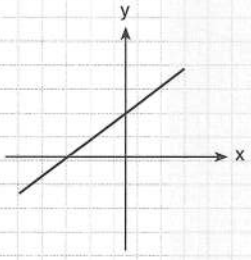
ÖZELLİK | Property 1

Polinomsal Fonksiyonların Limiti
Limit of Polynomial Functions

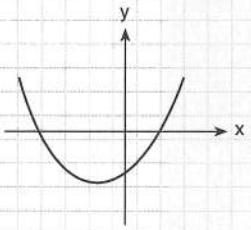
- Polinomsal fonksiyonlar bütün reel sayılarda tanımlı ve süreklidir. Dolayısıyla bir noktadaki limiti o noktadaki görüntüsüne eşittir.

  Polynomial functions are defined and continuous on every reel number. Accordingly limit on a point is equal to the image on the same point.

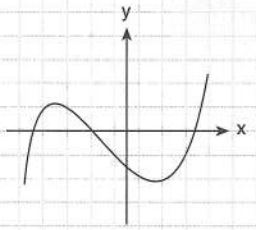
$$\lim_{x \to a} f(x) = f(a)$$



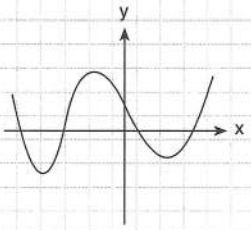
$f(x) = mx + n$



$f(x) = ax^2 + bx + c$



$f(x) = ax^3 + bx^2 + cx + d$



$f(x) = ax^4 + bx^3 + cx^2 + dx + e$

1. $\lim_{x \to 2} (3x - 1) = ?$ — 5

2. $\lim_{x \to 1} (x^2 - 3x) = ?$ — -2

3. $\lim_{x \to 6} (x^2 - 2x + 1) = ?$ — 25

4. $\lim_{x \to a} \left(\frac{2x+1}{3}\right) = 1$

$\Rightarrow a = ?$ — 1

5. $\lim_{x \to -2} (-x^2 - x + 1) = ?$ — -1

6. $\lim_{x \to -3} (-x^3 - 1) = ?$ — 26

7. $\lim_{x \to -1} (x^4 - x^3 + x^2 - x + 1) = ?$ — 5

8. $\lim_{x \to 4} (x^3 - 3x^2 + 3x - 1) = ?$ — 27

ÖZELLİK | Property 2

Rasyonel Fonksiyonların Limiti

Limit of Rational Functions

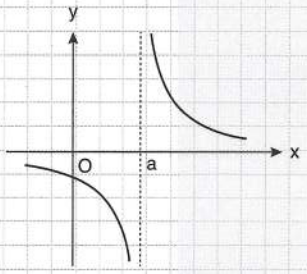
$a \in R$

$$f(x) = \frac{h(x)}{g(x)}$$

g(a) = 0 ise a noktası f(x) fonksiyonunun kritik noktasıdır. Fonksiyon kritik nokta haricinde süreklidir. Kritik noktada limit istenirse fonksiyonun sağ ve sol limitleri incelenir. Kritik nokta haricinde limit görüntüye eşittir.

If g(a)=0, a point is the critical point of f(x) function. The functions is continuous except the critical point. If limit is asked on the critical point righ-hand and left-hand limits are analysed. Limit is equal to the image except the critical point.

$f(x) = \frac{1}{x-a}$ a kritik nokta *(a critical point)*



$k \in R^+$

$\frac{1}{\infty} = 0$	$\frac{k}{\infty} = 0$
$\frac{1}{-\infty} = 0$	$\frac{k}{-\infty} = 0$
$\frac{1}{0^+} = \infty$	$\frac{k}{0^+} = \infty$
$\frac{1}{0^-} = -\infty$	$\frac{k}{0^-} = -\infty$

1. $\lim\limits_{x \to 2}\left(\frac{2x-6}{x+1}\right) = ?$ $\boxed{\frac{-2}{3}}$

2. $\lim\limits_{x \to 3}\left(\frac{x^2-1}{x+3}\right) = ?$ $\boxed{\frac{4}{3}}$

3. $\lim\limits_{x \to 1}\left(\frac{x-1}{x+3}\right) = ?$ $\boxed{0}$

4. $\lim\limits_{x \to -2}\left(\frac{x+3}{x^2-1}\right) = ?$ $\boxed{\frac{1}{3}}$

5. $\lim\limits_{x \to 2^+}\left(\frac{3}{x-2}\right) = ?$ $\boxed{\infty}$

6. $\lim\limits_{x \to 1^-}\left(\frac{5}{x-1}\right) = ?$ $\boxed{-\infty}$

7. $\lim\limits_{x \to 3^+}\left(\frac{-7}{x-3}\right) = ?$ $\boxed{-\infty}$

8. $\lim\limits_{x \to 2}\left(\frac{2x+1}{x-2}\right) = ?$ $\boxed{\varnothing}$

9. $\lim\limits_{x \to -2^+}\left(\frac{5}{x+2}\right) = ?$ $\boxed{\infty}$

10. $\lim\limits_{x \to 2}\left(\frac{3x-1}{(x-2)^2}\right) = ?$ $\boxed{\infty}$

11. $\lim\limits_{x \to \infty}\left(\frac{3}{x+1}\right) = ?$ $\boxed{0}$

12. $\lim\limits_{x \to -\infty}\left(\frac{4}{x-3}\right) = ?$ $\boxed{0}$

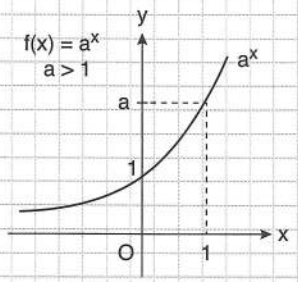
ÖZELLİK | Property 3

Üstel Fonksiyonların Limiti
Limit of Exponential Functions

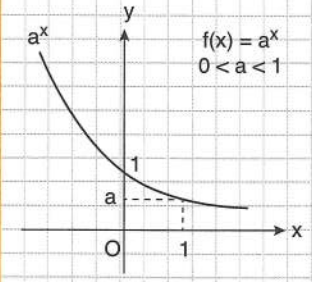
$f(x) = a^{g(x)} \qquad a > 0 \qquad a \neq 1$

Üstel fonksiyon bütün reel sayılarda tanımlı ve süreklidir. Dolayısıyla bir noktadaki limiti, o noktadaki görüntüsüne eşittir.

Exponential function is defined and continuous in all real numbers. Accordingly limit on a point is equal to the image on the same point.



$1 < a$
$a^{\infty} = \infty$
$a^{-\infty} = 0$



$0 < a < 1$
$a^{\infty} = 0$
$a^{-\infty} = \infty$

1. $\lim\limits_{x \to 2} (3^x + 1) = ?$ — 10

2. $\lim\limits_{x \to -1} (4^x - 1) = ?$ — $-\frac{3}{4}$

3. $\lim\limits_{x \to 1} (2^x + x^2 - 2) = ?$ — 1

4. $\lim\limits_{x \to \infty} (4^x - 3) = ?$ — ∞

5. $\lim\limits_{x \to 0} \left(\frac{3^x + 3^x}{5^x}\right) = ?$ — 2

6. $\lim\limits_{x \to -\infty} (2^x - 7) = ?$ — -7

7. $\lim\limits_{x \to \infty} \left(\frac{3}{5}\right)^x = ?$ — 0

8. $\lim\limits_{x \to -\infty} \left(\frac{7}{4}\right)^x = ?$ — 0

9. $\lim\limits_{x \to -\infty} (9^x + 1) = ?$ — 1

10. $\lim\limits_{x \to -\infty} \left(3^{\frac{1}{x}}\right) = ?$ — 1

11. $\lim\limits_{x \to 0^-} \left(3^x + 3^{\frac{1}{x}}\right) = ?$ — 1

ÖZELLİK | Property 4

Logaritma Fonksiyonun Limiti

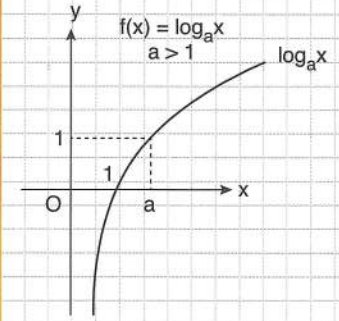
Limit of Logaritmic Function

$f(x) = \log_a g(x) \qquad g(x) > 0$

Logaritma fonksiyonu tanımlı olduğu aralıkta süreklidir. Dolayısıyla bir noktadaki limiti, o noktadaki görüntüsüne eşittir.

Logaritmic Function is continuous in the defined interval. Accordingly limit on a point is equal to the image on the same point.

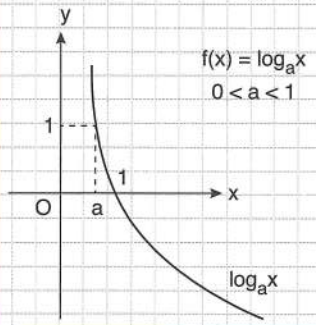
$$\lim_{x \to k} (\log_a g(x)) = \log_a \left(\lim_{x \to k} g(x) \right)$$



$1 < a$

$\lim_{x \to 0^+} (\log_a x) = -\infty$

$\lim_{x \to \infty} (\log_a x) = \infty$



$0 < a < 1$

$\lim_{x \to 0^+} (\log_a x) = \infty$

$\lim_{x \to \infty} (\log_a x) = -\infty$

1. $\lim_{x \to 2} (\log_3(x+7)) = ?$ — 2

2. $\lim_{x \to 1} \left(\log_{\frac{1}{3}} (x+2)\right) = ?$ — -1

3. $\lim_{x \to \infty} (\log_4 x) = ?$ — ∞

4. $\lim_{x \to 0^+} (\log_2 x) = ?$ — $-\infty$

5. $\lim_{x \to \infty} \left(\log_{\frac{1}{2}} x\right) = ?$ — $-\infty$

6. $\lim_{x \to 0^+} \left(\log_{\frac{1}{3}} x\right) = ?$ — ∞

7. $\lim_{x \to 2} \left(x^2 + \log_2 x\right) = ?$ — 5

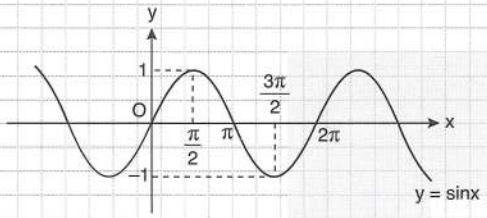
8. $\lim_{x \to -1} \left(x^2 - x + \log_3(-x)\right) = ?$ — 2

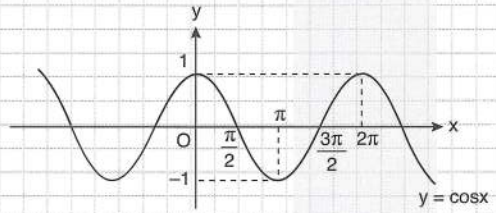
ÖZELLİK | Property 5

Trigonometrik Fonksiyonların Limiti
Limit of Trigonometric Functions

Sinüs ve kosinüs fonksiyonları bütün reel sayılarda tanımlı ve süreklidir.

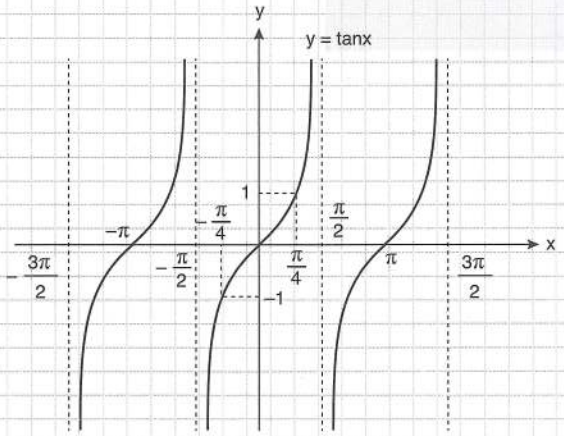
Sinus and cosinus functions are defined and continuous in all real numbers.





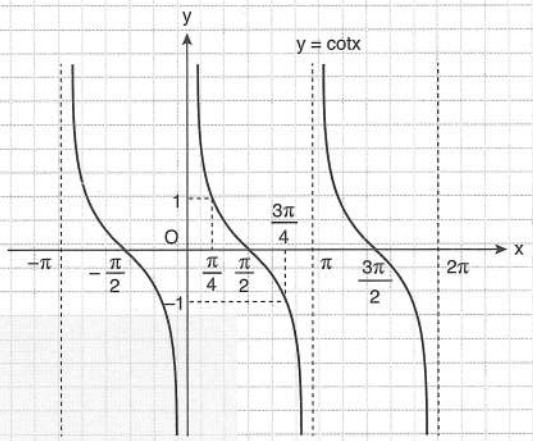
Tanjant ve kotanjant fonksiyonları tanımlı olduğu aralıkta süreklidir.

Tangent and cotangent functions are defined and continuous in the defined interval.



Tanjant fonksiyonu $\frac{\pi}{2} + k \cdot \pi$ $(k \in Z)$ noktalarında tanımsızdır.

Tangent function is undefined on $\frac{\pi}{2} + k \cdot \pi$ $(k \in Z)$ points.



Kotanjant fonksiyonu $k \cdot \pi$ $(k \in Z)$ noktalarında tanımsızdır.

cotanjent functions are undefined in the $k \cdot \pi$ $(k \in Z$ points.

- Tanımsız olan noktalarda fonksiyonun sağ ve sol limitleri incelenir.

  On undefined points right-hand and left-hand limits are analysed.

1. $\lim\limits_{x \to \frac{\pi}{3}} (\sin x) = ?$

$\frac{\sqrt{3}}{2}$

2. $\lim\limits_{x \to \pi} (\cos x) = ?$

-1

3. $\lim\limits_{x \to \frac{\pi}{4}} (\sin x) = ?$

$\frac{\sqrt{2}}{2}$

4. $\lim\limits_{x \to \frac{\pi}{3}} (\cos x) = ?$

$\frac{1}{2}$

5. $\lim\limits_{x \to \frac{\pi}{4}} (\tan x) = ?$

1

6. $\lim\limits_{x \to \frac{\pi}{2}} (\cot x) = ?$

0

7. $\lim\limits_{x \to \frac{\pi}{2}^+} (\tan x) = ?$

$-\infty$

8. $\lim\limits_{x \to \frac{\pi}{2}^-} (\tan x) = ?$

∞

9. $\lim\limits_{x \to \frac{\pi}{2}} (\tan x) = ?$

$\varnothing$

10. $\lim\limits_{x \to \pi^+} (\cot x) = ?$

∞

11. $\lim\limits_{x \to \pi^-} (\cot x) = ?$

$-\infty$

12. $\lim\limits_{x \to \pi} (\cot x) = ?$

$\varnothing$

ÖZELLİK | Property 6

f(x) ve g(x) sürekli fonksiyonlar

f(x) and g(x) are the continuous functions

- $\lim\limits_{x\to a}(f(x)\pm g(x)) = \lim\limits_{x\to a} f(x) \pm \lim\limits_{x\to a} g(x)$
- $\lim\limits_{x\to a}(k\cdot f(x)) = k\cdot \lim\limits_{x\to a} f(x) \qquad k\in R$
- $\lim\limits_{x\to a}(f(x)\cdot g(x)) = \lim\limits_{x\to a} f(x)\cdot \lim\limits_{x\to a} g(x)$
- $\lim\limits_{x\to a}\left(\dfrac{f(x)}{g(x)}\right) = \dfrac{\lim\limits_{x\to a} f(x)}{\lim\limits_{x\to a} g(x)} \qquad g(x)\neq 0$
- $\lim\limits_{x\to a} c^{f(x)} = c^{\left(\lim\limits_{x\to a} f(x)\right)}$
- $\lim\limits_{x\to a}(\log_k f(x)) = \log_k\left(\lim\limits_{x\to a} f(x)\right)$
- $\lim\limits_{x\to a} \sqrt[n]{f(x)} = \sqrt[n]{\lim\limits_{x\to a} f(x)}$

1. $\lim\limits_{x\to 2}(x^2-3^x+1) = ?$ $\boxed{-4}$

2. $\lim\limits_{x\to 3}\sqrt{x^2-x-2} = ?$ $\boxed{2}$

3. $\lim\limits_{x\to 3}\left[(x-3)(x^5+5^x+10)\right] = ?$ $\boxed{0}$

4. $\lim\limits_{x\to \pi}(x\cdot\cos x) = ?$ $\boxed{-\pi}$

5. $\lim\limits_{x\to \infty}\left(3^{-x}+5^{\frac{1}{x}}\right) = ?$ $\boxed{1}$

6. $\lim\limits_{x\to 3}\left(\log_5(x^3-2)\right) = ?$ $\boxed{2}$

7. $\lim\limits_{x\to 1}\left(\sqrt[3]{x^2-9}+\sin\left(\frac{\pi}{2}x\right)\right) = ?$ $\boxed{-1}$

8. $\lim\limits_{x\to \infty}\left(\dfrac{\sin(x+1)}{x^2+1}\right) = ?$ $\boxed{0}$

9. $\lim\limits_{x\to 2^+}\left(4^{\left(\frac{1}{x-2}\right)}\right) = ?$ $\boxed{\infty}$

ÖZELLİK | Property 7

$k \in R^+$

$k \cdot \infty = \infty$

$\infty + \infty = \infty$

$\infty^k = \infty$

$\infty + k = \infty$

$\infty \cdot \infty = \infty$

$k \in R^-$

$k \cdot \infty = -\infty$

$\infty^k = 0$

$\frac{1}{\infty} = 0$

$\frac{1}{-\infty} = 0$

1. $\lim\limits_{x \to \infty} (x^3 + 4) = ?$ $\boxed{\infty}$

2. $\lim\limits_{x \to \infty} (4 - x^2) = ?$ $\boxed{-\infty}$

3. $\lim\limits_{x \to \infty} \sqrt{x^2 + 6} = ?$ $\boxed{\infty}$

4. $\lim\limits_{x \to -\infty} (x^3 + 4) = ?$ $\boxed{-\infty}$

5. $\lim\limits_{x \to -\infty} (x^2 - 2) = ?$ $\boxed{\infty}$

6. $\lim\limits_{x \to -\infty} ((x+1) \cdot (x^2 - 3x + 4)) = ?$ $\boxed{-\infty}$

7. $\lim\limits_{x \to \infty} \left(\frac{4}{x+3}\right) = ?$ $\boxed{0}$

8. $\lim\limits_{x \to \infty} \left(\frac{\cos(x-2)}{x+1}\right) = ?$ $\boxed{0}$

9. $\lim\limits_{x \to \infty} \left(2^x - 3^{\frac{1}{x}}\right) = ?$ $\boxed{\infty}$

10. $\lim\limits_{x \to \infty} \left(\frac{2}{3}\right)^x = ?$ $\boxed{0}$

11. $\lim\limits_{x \to \infty} \left(\frac{6}{5}\right)^x = ?$ $\boxed{\infty}$

ÖZELLİK | Property 8

$\frac{\infty}{\infty}$ **Belirsizliği** | $\frac{\infty}{\infty}$ Uncertainty

$a, b \in R \qquad m, n \in N^+$

- $f(x) = \dfrac{ax^n + \dots\dots\dots}{bx^m + \dots\dots\dots}$

$\lim\limits_{x \to \infty} f(x) = S$

a) $n > m \Rightarrow S = \pm\infty$

b) $n = m \Rightarrow S = \dfrac{a}{b}$

c) $n < m \Rightarrow S = 0$

- $x \to \infty$

$x^n < a^x < x! < x^x$

1. $\lim\limits_{x \to \infty} \dfrac{3x+2}{x-2} = ?$ $\boxed{3}$

2. $\lim\limits_{x \to \infty} \dfrac{x^2}{2x+1} = ?$ $\boxed{\infty}$

3. $\lim\limits_{x \to \infty} \dfrac{3x^2-2}{x^3+1} = ?$ $\boxed{0}$

4. $\lim\limits_{x \to -\infty} \dfrac{x^2}{x+3} = ?$ $\boxed{-\infty}$

5. $\lim\limits_{x \to -\infty} \dfrac{x^3+3}{x+1} = ?$ $\boxed{\infty}$

6. $\lim\limits_{x \to \infty} \left(\dfrac{x^3+x^2+1}{3x^2+7}\right) = ?$ $\boxed{\infty}$

7. $\lim\limits_{x \to \infty} \left(\dfrac{5x^2+7x+1}{6x^2+4}\right) = ?$ $\boxed{\frac{5}{6}}$

8. $\lim\limits_{x \to \infty} \left(\dfrac{4x^2+1}{7x^3-1}\right) = ?$ $\boxed{0}$

9. $\lim\limits_{x \to \infty} \left(\dfrac{x^2-x+1}{3+x-x^3}\right) = ?$ $\boxed{0}$

10. $\lim\limits_{x \to \infty} \left(\dfrac{4x^3+5x+1}{2x^2+4}\right) = ?$ $\boxed{\infty}$

11. $\lim\limits_{x \to -\infty} \left(-\dfrac{3x^3-x+1}{x^2+7}\right) = ?$ $\boxed{\infty}$

12. $\lim\limits_{x \to \infty} \dfrac{\sqrt{9x^2-2x+1}}{2x} = ?$ $\boxed{\frac{3}{2}}$

13. $\lim\limits_{x \to \infty} \dfrac{\sqrt{16x^2+2x-3}}{\sqrt[3]{8x^3-2x+1}} = ?$ $\boxed{2}$

14. $\lim\limits_{x \to -\infty} \dfrac{\sqrt{4x^2-2x}}{\sqrt[3]{x^3+1}} = ?$ $\boxed{-2}$

15. $\lim\limits_{x\to\infty}\left(\dfrac{\sqrt{x^2+5x+1}+x}{\sqrt{4x^2+3x}-3x-2}\right)=?$ $\boxed{-2}$

16. $\lim\limits_{x\to\infty}\left(\dfrac{\sqrt[3]{27x^3+x^2}+2x-1}{\sqrt{9x^2+5x}+x-3}\right)=?$ $\boxed{\dfrac{5}{4}}$

17. $\lim\limits_{x\to-\infty}\left(\dfrac{\sqrt{x^2+1}+3x+1}{2x+1}\right)=?$ $\boxed{1}$

18. $\lim\limits_{x\to-\infty}\left(\dfrac{\sqrt[3]{x^3+1}-2x+1}{\sqrt{x^2-1}+2x-1}\right)=?$ $\boxed{-1}$

19. $\lim\limits_{x\to-\infty}\left(\dfrac{\sqrt{x^2+x+7}+5x+1}{\sqrt{16x^2+4x}+3x+2}\right)=?$ $\boxed{-4}$

20. $\lim\limits_{x\to\infty}\left(\dfrac{2^x}{x^7}\right)=?$ $\boxed{\infty}$

21. $\lim\limits_{x\to\infty}\left(\dfrac{3^x}{x!}\right)=?$ $\boxed{0}$

22. $\lim\limits_{x\to\infty}\left(\dfrac{2^{x+1}+x^2}{2^{x-1}+x^3}\right)=?$ $\boxed{4}$

23. $\lim\limits_{x\to\infty}\left(\dfrac{5^{x-1}+x^{x+1}}{5^x+x^{x-1}}\right)=?$ $\boxed{\infty}$

24. $\lim\limits_{x\to\infty}\dfrac{2^x-3x}{x^x+1}=?$ $\boxed{0}$

25. $\lim\limits_{x\to\infty}\dfrac{x!-\cos(2x)}{3x+1}=?$ $\boxed{\infty}$

26. $\lim\limits_{x\to\infty}\dfrac{\cos x-x!}{3^x-4^x}=?$ $\boxed{\infty}$

27. $\lim\limits_{x\to\infty}\dfrac{3^x-2^x}{4^x+3^x}=?$ $\boxed{0}$

28. $\lim\limits_{x\to-\infty}\dfrac{2^{x+1}+5^x}{2^x-5^{x+1}}=?$ $\boxed{2}$

29. $\lim\limits_{x\to\infty}\dfrac{x^3-2x}{x!+x^x}=?$ $\boxed{0}$

30. $\lim\limits_{x\to-\infty}\left(\dfrac{2^x+3^{x+1}}{2^{x-1}+5^{x-3}}\right)=?$ $\boxed{2}$

ÖZELLİK | Property 9

$\frac{0}{0}$ **Belirsizliği** | $\frac{0}{0}$ Uncertainty

$$\lim_{x \to a} = \frac{P(x)}{Q(x)} = \frac{0}{0}$$

P(x) ve Q(x) ifadeleri çarpanlarına ayrılarak sıfır yapan ifadeler sadeleştirilir.

P(x) and Q(x) are factorized and the factors that make the equation zero get cancelled.

$$\lim_{x \to a} = \frac{\cancel{(x-a)} \cdot P_1(x)}{\cancel{(x-a)} \cdot Q_1(x)} = \lim_{x \to a} \frac{P_1(x)}{Q_1(x)}$$

1. $\lim_{x \to 1} \left(\frac{x^2-1}{x-1}\right) = ?$ $\boxed{2}$

2. $\lim_{x \to 2} \left(\frac{x^2-3x+2}{x-2}\right) = ?$ $\boxed{1}$

3. $\lim_{x \to -1} \left(\frac{x^2+3x+2}{x^2-1}\right) = ?$ $\boxed{-\frac{1}{2}}$

4. $\lim_{x \to 1} \left(\frac{x^3-1}{x^2-1}\right) = ?$ $\boxed{\frac{3}{2}}$

5. $\lim_{x \to 2^+} \left(\frac{x-2}{|x^2-4|}\right) = ?$ $\boxed{\frac{1}{4}}$

6. $k \in R$

$\lim_{x \to 1} \left(\frac{x^2+ax-4}{x^2-1}\right) = k$

$\Rightarrow a = ?$ $\boxed{3}$

7. $k \in R$

$\lim_{x \to 2} \left(\frac{x^2+ax+6}{x^2-3x+2}\right) = k$

$\Rightarrow a = ?$ $\boxed{-5}$

ÖZELLİK | Property 10

$\frac{0}{0}$ **Belirsizliği** | $\frac{0}{0}$ Uncertainty

Köklü ifadelerde $\frac{0}{0}$ belirsizliği varsa köklü ifadenin eşleniği ile genişletme işlemi yapılır.

In radical expressions if there is $0/0$ uncertainty both parts of the fraction is to be multiplied by the conjugate.

Örnek | Example

$\lim_{x \to 3} \left(\frac{x-3}{\sqrt{x}-\sqrt{3}}\right) = ?$

Çözüm | Answer

$$\lim_{x \to 3} \left(\frac{x-3}{\sqrt{x}-\sqrt{3}}\right) = \lim_{x \to 3} \frac{(x-3)(\sqrt{x}+\sqrt{3})}{(\sqrt{x}-\sqrt{3})(\sqrt{x}+\sqrt{3})}$$

$$= \lim_{x \to 3} \frac{\cancel{(x-3)}(\sqrt{x}+\sqrt{3})}{\cancel{(x-3)}}$$

$$= \lim_{x \to 3} (\sqrt{x}+\sqrt{3})$$

$$= 2\sqrt{3}$$

1. $\lim_{x \to 4} \left(\frac{x-4}{\sqrt{x}-2}\right) = ?$ $\boxed{4}$

2. $\lim_{x \to 2} \left(\frac{x^2-4}{\sqrt{x+7}-3}\right) = ?$ $\boxed{24}$

3. $\lim_{x \to 3} \left(\frac{x-3}{\sqrt{x+1}-2}\right) = ?$ $\boxed{4}$

4. $\lim_{x \to 1} \left(\frac{\sqrt{x+3}-2}{\sqrt{x}-1}\right) = ?$ $\boxed{\frac{1}{2}}$

ÖZELLİK | Property 11

$\frac{0}{0}$ **Belirsizliği** | $\frac{0}{0}$ Uncertainty

$x \to 0$

$x \cong \sin x \cong \tan x$

- $\lim\limits_{x \to 0} \frac{\sin x}{x} = 1$

  $\lim\limits_{x \to 0} \frac{ax}{\sin(bx)} = \frac{a}{b}$

  $\lim\limits_{x \to 0} \frac{\sin(ax)}{bx} = \frac{a}{b}$

- $\lim\limits_{x \to 0} \frac{\tan x}{x} = 1$

  $\lim\limits_{x \to 0} \frac{ax}{\tan(bx)} = \frac{a}{b}$

  $\lim\limits_{x \to 0} \frac{\tan(ax)}{bx} = \frac{a}{b}$

1. $\lim\limits_{x \to 0} \left(\frac{\sin(3x)}{x}\right) = ?$ $\boxed{3}$

2. $\lim\limits_{x \to 0} \left(\frac{\sin(3x)}{4x}\right) = ?$ $\boxed{\frac{3}{4}}$

3. $\lim\limits_{x \to 0} \left(\frac{\tan(5x)}{3x}\right) = ?$ $\boxed{\frac{5}{3}}$

4. $\lim\limits_{x \to 0} \left(\frac{\tan(5x)}{\sin(2x)}\right) = ?$ $\boxed{\frac{5}{2}}$

5. $\lim\limits_{x \to 0} \left(\frac{\sin(6x)}{\tan(2x)}\right) = ?$ $\boxed{3}$

6. $\lim\limits_{x \to 0} \left(\frac{\sin(3x)+x}{\tan(5x)-x}\right) = ?$ $\boxed{1}$

7. $\lim\limits_{x \to 0} (4x \cdot \operatorname{cosec}(3x)) = ?$ $\boxed{\frac{4}{3}}$

8. $\lim\limits_{x \to 2} \left(\frac{\sin(x-2)}{2x-4}\right) = ?$ $\boxed{\frac{1}{2}}$

9. $\lim\limits_{x \to 3} \left(\frac{x-3}{\tan(3x-9)}\right) = ?$ $\boxed{\frac{1}{3}}$

10. $\lim\limits_{x \to 1} \left(\frac{\tan(x-1)}{(x-1)}\right) = ?$ $\boxed{1}$

11. $\lim\limits_{x \to 2} \left(\frac{x^2-4}{\sin(x-2)}\right) = ?$ $\boxed{4}$

12. $\lim\limits_{x \to 2} \left(\frac{\sin(6x-12)}{x-2}\right) = ?$ $\boxed{6}$

13. $\lim\limits_{x \to 3} \left(\frac{\sin(x-3)}{x^2-9}\right) = ?$ $\boxed{\frac{1}{6}}$

14. $\lim\limits_{x \to 0} \left(\frac{\sin^2(2x)}{9x^2}\right) = ?$ $\boxed{\frac{4}{9}}$

ÖZELLİK | Property 12

$\infty - \infty$ **Belirsizliği** | $\infty - \infty$ Uncertainty

$$\lim_{x\to\infty}\sqrt{ax^2+bx+c} = \lim_{x\to\infty}\left(\sqrt{a}\left|x+\frac{b}{2a}\right|\right)$$

1. $\lim\limits_{x\to\infty}\left(\sqrt{x^2+2x+3}-x\right) = ?$ $\boxed{1}$

2. $\lim\limits_{x\to\infty}\left(\sqrt{4x^2-4x+1}-2x-2\right) = ?$ $\boxed{-3}$

3. $\lim\limits_{x\to-\infty}\left(\sqrt{4x^2+4x+1}+2x\right) = ?$ $\boxed{-1}$

4. $\lim\limits_{x\to\infty}\left(\sqrt{9x^2-3x+1}-\sqrt{4x^2-4}\right) = ?$ $\boxed{\infty}$

5. $\lim\limits_{x\to\infty}\left(\sqrt{4x^2-2x}-\sqrt{4x^2+x}\right) = ?$ $\boxed{\frac{-3}{4}}$

6. $\lim\limits_{x\to\infty}\left(\sqrt{x^2+3x}-\sqrt{x^2+x}\right) = ?$ $\boxed{1}$

7. $\lim\limits_{x\to\infty}\left(\sqrt{4x^2+ax+4}-2x\right) = \frac{3}{2}$ $\boxed{6}$

$\Rightarrow a = ?$

8. $\lim\limits_{x\to\infty}\left(\sqrt{x^2+6x-3}+mx+1\right) = 4$ $\boxed{-1}$

$\Rightarrow m = ?$

ÖZELLİK | Property 13

$0\cdot\infty$ **Belirsizliği** | $0\cdot\infty$ Uncertainty

$$x\to\infty \qquad \frac{1}{x}\to 0$$

$\frac{1}{x} = t$ dönüşümü yapılarak $0\cdot\infty$ belirsizliği $\frac{\infty}{\infty}$ veya $\frac{0}{0}$ belirsizliğine dönüştürülür.

By doing the conversion of $1/x = t$, $0\cdot\infty$ uncertainty is converted to ∞/∞ or $0/0$ uncertainty

1. $\lim\limits_{x\to\infty}\left(2x\cdot\sin\left(\frac{3}{x}\right)\right) = ?$ $\boxed{6}$

2. $\lim\limits_{x\to\infty}\left(4x\cdot\tan\left(\frac{1}{x}\right)\right) = ?$ $\boxed{4}$

3. $\lim\limits_{x\to\infty}\left(\frac{x}{2}\cdot\tan\left(\frac{1}{x}\right)\right) = ?$ $\boxed{\frac{1}{2}}$

4. $\lim\limits_{x\to\infty}\left(\frac{x}{\cot\left(\frac{1}{x}\right)}\right) = ?$ $\boxed{1}$

5. $\lim\limits_{x\to\infty}\left(\frac{\frac{x}{3}}{\cot\left(\frac{2}{x}\right)}\right) = ?$ $\boxed{\frac{2}{3}}$

6. $\lim\limits_{x\to\infty}\left(x^2\cdot\sin\left(\frac{2}{x}\right)\cdot\tan\left(\frac{3}{x}\right)\right) = ?$ $\boxed{6}$

7. $\lim\limits_{x\to\infty}\left(x^2\cdot\sin^2\left(\frac{4}{x}\right)\right) = ?$ $\boxed{16}$

ÖZELLİK | Property 14

1^∞ Belirsizliği | 1^∞ Uncertainty

- $\lim\limits_{x\to\infty}\left(1+\frac{1}{x}\right)^x = e$
- $\lim\limits_{x\to\infty}\left(1+\frac{a}{bx+c}\right)^{dx+f} = e^{\left(\frac{a\cdot d}{b}\right)}$
- $x\to\infty \qquad g(x)\to 0 \qquad h(x)\to\infty$

$\lim\limits_{x\to\infty}(1+g(x))^{h(x)} = 1^\infty$

$\lim\limits_{x\to\infty}(g(x)\cdot h(x)) = k$

$\Rightarrow \lim\limits_{x\to\infty}(1+g(x))^{h(x)} = e^k$

1. $\lim\limits_{x\to\infty}\left(1+\frac{2}{x}\right)^{3x} = ?$ $\boxed{e^6}$

2. $\lim\limits_{x\to\infty}\left(1-\frac{2}{x}\right)^{(x+1)} = ?$ $\boxed{e^{-2}}$

3. $\lim\limits_{x\to\infty}\left(1-\frac{4}{x+3}\right)^{2x+1} = ?$ $\boxed{e^{-8}}$

4. $\lim\limits_{x\to\infty}\left(\frac{x+4}{x+1}\right)^{2x-1} = ?$ $\boxed{e^6}$

5. $\lim\limits_{x\to\infty}\left(\frac{2x+5}{2x+2}\right)^{2x-2} = ?$ $\boxed{e^3}$

6. $\lim\limits_{x\to\infty}\left(\frac{3x+2}{x+1}\right)^{x+1} = ?$ $\boxed{\infty}$

7. $\lim\limits_{x\to\infty}\left(\frac{x-2}{2x+1}\right)^{x-3} = ?$ $\boxed{0}$

8. $\lim\limits_{x\to\infty}\left(\frac{x-1}{2x+1}\right)^{x} = ?$ $\boxed{0}$

9. $\lim\limits_{x\to-\infty}\left(1+\frac{6}{x+1}\right)^{\left(\frac{x+3}{2}\right)} = ?$ $\boxed{e^3}$

10. $\lim\limits_{x\to\infty}\left(1+\frac{2x}{x^2-1}\right)^{3x+5} = ?$ $\boxed{e^6}$

11. $\lim\limits_{x\to\infty}\left(1-\frac{3x+1}{2x^2-4}\right)^{6x-1} = ?$ $\boxed{e^{-9}}$

12. $\lim\limits_{x\to\infty}\left(\frac{3x^2-1}{3x^2+2x}\right)^{4x-7} = ?$ $\boxed{e^{\left(-\frac{8}{3}\right)}}$

ÖZELLİK | Property 15

Parçalı Fonksiyonun Limiti

Limit of Piecewise Function

$a \in R$

$$f(x) = \begin{cases} g(x) & x \geq a \\ h(x) & x < a \end{cases}$$

a noktası, f fonksiyonunun kritik noktasıdır.
Kritik noktalarda sağ ve sol limitler incelenir.

a point is the critical point of f function. On critical points right-hand and left-hand limits are to be analysed.

$$\lim_{x \to a^+} f(x) = g(a)$$

$$\lim_{x \to a^-} f(x) = h(a)$$

1. $f(x) = \begin{cases} 2x+1 & x \geq 1 \\ x-2 & x < 1 \end{cases}$

$\Rightarrow \lim\limits_{x \to 1^-} f(x) = ?$ $\boxed{-1}$

2. $f(x) = \begin{cases} x-3 & x > 2 \\ 3x+1 & x \leq 2 \end{cases}$

$\Rightarrow \lim\limits_{x \to 2^+} f(x) = ?$ $\boxed{-1}$

3. $f(x) = \begin{cases} x^2-1 & x > 2 \\ 3x+2 & x \leq 2 \end{cases}$

$\Rightarrow \lim\limits_{x \to 2} f(x) = ?$ $\boxed{\varnothing}$

4. $f(x) = \begin{cases} 3x+1 & x > 1 \\ x^2+3 & x \leq 1 \end{cases}$

$\Rightarrow \lim\limits_{x \to 1} f(x) = ?$ $\boxed{4}$

5. $f(x) = \begin{cases} x^2+3 & x > -2 \\ 5-x & x \leq -2 \end{cases}$

$\Rightarrow \lim\limits_{x \to -2} f(x) = ?$ $\boxed{7}$

6. $a, k \in R$

$f(x) = \begin{cases} kx+4 & x > -1 \\ -2x^3 & x \leq -1 \end{cases}$

$\lim\limits_{x \to -1} f(x) = a$

$\Rightarrow k = ?$ $\boxed{2}$

7. $a, k \in R$

$f(x) = \begin{cases} kx+2 & x > 1 \\ x+4 & x \leq 1 \end{cases}$

$\lim\limits_{x \to 1} f(x) = a$

$\Rightarrow k = ?$ $\boxed{3}$

8. $f(x) = \begin{cases} 2x-1 & x > 2 \\ a & x = 2 \\ x+1 & x < 2 \end{cases}$

$\lim\limits_{x \to 2} f(x) = f(2)$

$\Rightarrow a = ?$ $\boxed{3}$

9. $f(x) = \begin{cases} 2x & x > 1 \\ a & x = 1 \\ x^2+1 & x < 1 \end{cases}$

$\lim\limits_{x \to 1} f(x) = f(1)$

$\Rightarrow a = ?$ $\boxed{2}$

10. $f(x) = \begin{cases} 3x+2 & x > 1 \\ kx-1 & x \leq 1 \end{cases}$

$\lim\limits_{x \to 1} f(x) = f(1)$

$\Rightarrow k = ?$ $\boxed{6}$

11. $f(x) = \begin{cases} 2x+b & x > 1 \\ 6 & x = 1 \\ ax+1 & x < 1 \end{cases}$

$\lim\limits_{x \to 1} f(x) = f(1)$

$\Rightarrow a + b = ?$ $\boxed{9}$

12. $f(x) = \begin{cases} x^2+a & x < -1 \\ 4 & x = -1 \\ bx+1 & x > -1 \end{cases}$

$\lim\limits_{x \to -1} f(x) = f(-1)$

$\Rightarrow a \cdot b = ?$ $\boxed{-9}$

13. $f(x) = \begin{cases} x-4a & x > 1 \\ 5 & x = 1 \\ x^2+b & x < 1 \end{cases}$

$\lim\limits_{x \to 1} f(x) = f(1)$

$\Rightarrow a + b = ?$ $\boxed{3}$

ÖZELLİK | Property 16

Mutlak Değer Fonksiyonunun Limiti
Limit of Absolute Value Function

$a \in R$

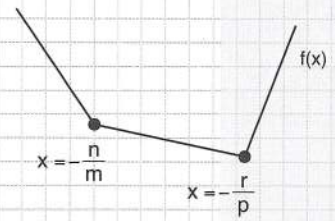
$f(x) = |g(x)|$

$g(a) = 0$

a noktası, f fonksiyonunun kritik noktasıdır.
a point is the critical point of function

- $f(x) = |mx + n| + |px + r|$

f fonksiyonu, bütün reel sayılarda tanımlı ve süreklidir.
f function is defined and continues in all real numbers.



1. $\lim\limits_{x \to 2} \left(|x+5| + x - 3\right) = ?$

6

2. $\lim\limits_{x \to 1} \left(|4x-4| \cdot x + x^2 + 7\right) = ?$

8

3. $\lim\limits_{x \to 2} \left(|x-2| + x - 2\right) = ?$

0

4. $\lim\limits_{x \to 0^+} \left(\frac{|x|}{x}\right) = ?$

1

5. $\lim\limits_{x \to 0^-} \left(\frac{|x|}{x}\right) = ?$

−1

6. $\lim\limits_{x \to 0} \left(\frac{|x|}{x}\right) = ?$

Ø

7. $\lim\limits_{x \to 3^+} \left(\frac{x-3}{|x-3|}\right) = ?$

1

8. $\lim\limits_{x \to 2^+} \left(\frac{|x-2|}{x-2} + x\right) = ?$

3

9. $\lim\limits_{x \to 5} \left(\frac{|x-5|}{x-5}\right) = ?$

Ø

10. $\lim\limits_{x \to 1^-} \left(\frac{x^2-1}{|x-1|}\right) = ?$

−2

11. $\lim\limits_{x \to -2^-} \left(\frac{|x^2-4|}{x+2}\right) = ?$

−4

12. $\lim\limits_{x \to 2^-} \left(\frac{4-x^2}{|x^2-3x+2|}\right) = ?$

4

ÖZELLİK | Property 17

İşaret Fonksiyonun Limiti

Limit of Sign Function

$a \in R$

$f(x) = \text{sgn}(g(x))$

$g(a) = 0$

a noktası, f fonksiyonunun kritik noktasıdır. Kritik noktada sağ ve sol limitler incelenir. Diğer noktalarda fonksiyon süreklidir.

a point is the critical point of f function. In the critical point left-hand and right-hand functions are analyzed. On the other points function is continuous.

1. $\lim\limits_{x \to 5} \text{sgn}(x-1) = ?$ $\boxed{1}$

2. $\lim\limits_{x \to 2} \text{sgn}(x-5) = ?$ $\boxed{-1}$

3. $\lim\limits_{x \to 3^-} \text{sgn}(x-3) = ?$ $\boxed{-1}$

4. $\lim\limits_{x \to -2^+} \text{sgn}(x+2) = ?$ $\boxed{1}$

5. $\lim\limits_{x \to -1^-} \text{sgn}(x^2-1) = ?$ $\boxed{1}$

6. $\lim\limits_{x \to 3} \left(|x-2| \cdot \text{sgn}(x-3)\right) = ?$ $\boxed{\varnothing}$

7. $\lim\limits_{x \to 4^+} \dfrac{\text{sgn}(x-4)}{|x^2-2|} = ?$ $\boxed{\dfrac{1}{14}}$

8. $\lim\limits_{x \to 2^+} \dfrac{3}{\text{sgn}(x^2-4)} = ?$ $\boxed{3}$

9. $\lim\limits_{x \to 2} \dfrac{\text{sgn}(x-2)}{\text{sgn}(2-x)} = ?$ $\boxed{-1}$

10. $\lim\limits_{x \to 0} \left(\text{sgn}(x^2)\right) = ?$ $\boxed{1}$

11. $\lim\limits_{x \to \pi^+} \left(\text{sgn}(\sin x)\right) = ?$ $\boxed{-1}$

12. $\lim\limits_{x \to \frac{\pi}{2}} \text{sgn}(\cos x) = ?$ $\boxed{\varnothing}$

ÖZELLİK | Property 18

Tam Değer Fonksiyonun Limiti

Limit of Greatest interger Function

$a \in R$

$f(x) = [\![g(x)]\!]$

$g(a) \in Z$

a noktası, f fonksiyonunun kritik noktasıdır. Kritik noktada sağ ve sol limitler incelenir. Diğer noktalarda fonksiyon süreklidir.

a point is the critical point of f function. In the critical point left-hand and right-hand functions are analyzed. On the other points function is continuous.

1. $\lim\limits_{x \to \frac{3}{2}} [\![x]\!] = ?$ — 1

2. $\lim\limits_{x \to 2} [\![x]\!] = ?$ — Ø

3. $\lim\limits_{x \to -4^-} [\![x]\!] = ?$ — -5

4. $\lim\limits_{x \to -3} \left[\!\!\left[\frac{x}{2}\right]\!\!\right] = ?$ — -2

5. $\lim\limits_{x \to -\frac{1}{2}} [\![x]\!] = ?$ — -1

6. $\lim\limits_{x \to \frac{\pi}{2}^+} (\operatorname{sgn}(\tan x) + [\![\cos x]\!]) = ?$ — -2

7. $\lim\limits_{x \to 4} \sqrt{[\![x+2]\!] + \operatorname{sgn}(x+2)} = ?$ — Ø

8. $\lim\limits_{x \to 2^+} \left[\!\!\left[2x - \left[\!\!\left[x + \frac{1}{2}\right]\!\!\right]\right]\!\!\right] = ?$ — 2

9. $\lim\limits_{x \to 2^-} [\![x-2]\!] = ?$ — -1

10. $\lim\limits_{x \to \frac{3}{2}} ([\![x]\!] - |\operatorname{sgn}(-x)|) = ?$ — 0

11. $\lim\limits_{x \to 2^+} \left[\!\!\left[\frac{9x-2}{2}\right]\!\!\right] = ?$ — 8

12. $\lim\limits_{x \to 5^+} \left[\!\!\left[\frac{1-3x}{2}\right]\!\!\right] = ?$ — -8

13. $\lim\limits_{x \to \infty} \frac{[\![x]\!]}{x} = ?$ — 1

1. $\lim\limits_{x \to 3}(4x - 10) = ?$

A) –3 B) –2 C) 1 D) 2 E) 4

2. $\lim\limits_{x \to 1}(2x - 3) = ?$

A) –3 B) –2 C) –1 D) 1 E) 0

3. $\lim\limits_{x \to 3}(2x - a) = 3$
$\Rightarrow a = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

4. $\lim\limits_{x \to 4}(x - 2a) = -6$
$\Rightarrow a = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

5. $\lim\limits_{x \to 2}\left(\dfrac{x-2}{x+2}\right) = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

6. $\lim\limits_{x \to 1}\left(\dfrac{2x-2}{x+8}\right) = ?$

A) 0 B) 1 C) 2 D) 3 E) ∞

7. $\lim\limits_{x \to 2}(3x^2 - 4) = ?$

A) 12 B) 8 C) 4 D) 3 E) 1

8. $\lim\limits_{x \to 3}(2x^2 - 8) = ?$

A) 30 B) 25 C) 20 D) 15 E) 10

9. $\lim\limits_{x \to 2} \left(\dfrac{3x-2}{x+2} \right) = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

10. $\lim\limits_{x \to -2} \left(\dfrac{4x-2}{3-x} \right) = ?$

A) –5 B) –2 C) –1 D) 2 E) 3

11. $\lim\limits_{x \to a} \dfrac{3x+5}{2x} = 2$

$\Rightarrow a = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

12. $\lim\limits_{x \to a} \dfrac{4x-9}{x} = 7$

$\Rightarrow a = ?$

A) – 6 B) – 5 C) – 3 D) – 2 E) – 1

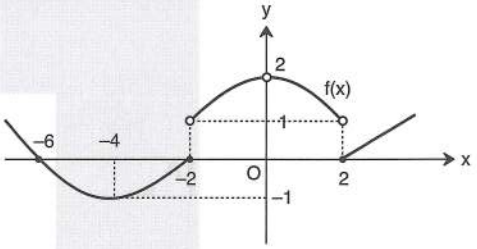
13. $\lim\limits_{x \to 2} (x^2 - 4x - 3) = ?$

A) – 10 B) – 9 C) – 8 D) – 7 E) – 6

14. $\lim\limits_{x \to 3} (2x^2 - 3x - 2) = ?$

A) 6 B) 7 C) 8 D) 9 E) 10

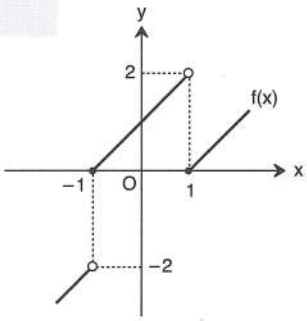
15.



$\Rightarrow \lim\limits_{x \to -6} f(x) + \lim\limits_{x \to -4} f(x) + \lim\limits_{x \to 0} f(x) = ?$

A) – 6 B) – 4 C) – 1 D) 0 E) 1

16.



$\Rightarrow \lim\limits_{x \to -1} f(x) = ?$

A) –1 B) 0 C) 1 D) 2 E) ∅

1. $\lim\limits_{x \to 0} \dfrac{3^x + 5^x}{2^x + 4^x} = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

2. $\lim\limits_{x \to 2} (\sqrt{3x^2 + 4} - 3^x) = ?$

A) -5 B) -4 C) 2 D) 4 E) 5

3. $\lim\limits_{x \to -1} \left((3x+2)^9 + (3x+4)^{10}\right) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

4. $\lim\limits_{x \to \frac{1}{4}} \left((16x^2 + 1) \cdot (4x - 3)\right) = ?$

A) -12 B) -4 C) $-\dfrac{13}{4}$ D) $\dfrac{21}{4}$ E) 12

5. $\lim\limits_{x \to 1} 3^{x^2 - 4x - 4} = ?$

A) 3^8 B) 3^4 C) 3^2 D) 3^{-7} E) 3^{-8}

6. $a \in R$

$\lim\limits_{x \to -3} \sqrt{x^2 - 10} = a$

$\Rightarrow a = ?$

A) -3 B) 1 C) 2 D) 4 E) $\varnothing$

7. $\lim\limits_{x \to 3} \sqrt[5]{2x^2 + 5x - 1} = ?$

A) 2 B) 3 C) 4 D) $\sqrt{33}$ E) $\sqrt{40}$

8. $\lim\limits_{x \to 25} \left(\log_5(x^3)\right) = ?$

A) 3 B) 6 C) 9 D) 10 E) 12

9. $\lim\limits_{x \to e} (\ln x^4 + \ln x) = ?$

A) 2 B) e C) 4 D) 5 E) e^2

10. $\lim\limits_{x \to 0^-} (2^x + 2^{\frac{1}{x}} - 2) = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) Ø

11. $\lim\limits_{x \to a} (x^3 - 1) = 7$

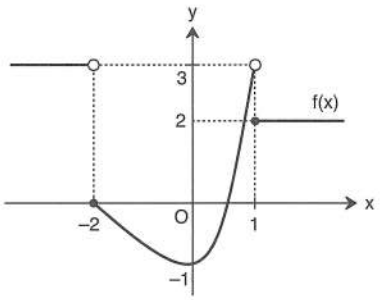
$\Rightarrow \lim\limits_{x \to a} (x^5 - 8) = ?$

A) 16 B) 24 C) 48 D) 64 E) 128

12. $\lim\limits_{x \to 3} \left(\frac{4x-3}{x-2} + \frac{3x+2}{2-x} \right) = ?$

A) -7 B) -5 C) -4 D) -2 E) -1

13.



$\Rightarrow \lim\limits_{x \to -2^+} f(x) + \lim\limits_{x \to 1^-} f(x) = ?$

A) 0 B) 2 C) 3 D) 5 E) 6

14. $f(x) = (x+1)^2$

$g(x) = (2x-2)^3$

$\Rightarrow \lim\limits_{x \to 3} \frac{f(x) + g(x)}{f(x) \cdot g(x)} = ?$

A) $\frac{5}{64}$ B) $\frac{1}{64}$ C) $\frac{1}{16}$ D) $\frac{1}{2}$ E) $\frac{5}{16}$

15. $m > 0$

$\lim\limits_{x \to a} f(x) = 2m$

$\lim\limits_{x \to a} g(x) = \frac{2m}{3}$

$\lim\limits_{x \to a} \left(f^2(x) - 6 \cdot g(x) \right) = 0$

$\Rightarrow m = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

16. $\lim\limits_{x \to a} (f(x) - g(x)) = 1$

$\lim\limits_{x \to a} (4f(x) - 3 \cdot g(x)) = 6$

$\Rightarrow \lim\limits_{x \to a} (f(x) \cdot g(x)) = ?$

A) 6 B) 8 C) 10 D) 12 E) 14

1. $\lim\limits_{x \to \infty} (x^2 - 4) = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) ∞

2. $\lim\limits_{x \to -\infty} (x - 3)^5 = ?$

A) $-\infty$ B) -2 C) -1 D) 0 E) ∞

3. $\lim\limits_{x \to -\infty} \sqrt{3x^2 + 2} = ?$

A) $-\infty$ B) 0 C) 1 D) 4 E) ∞

4. $\lim\limits_{x \to \infty} (\ln(x + e^2)) = ?$

A) $-\infty$ B) 0 C) 2 D) e E) ∞

5. $\lim\limits_{x \to -\infty} \dfrac{2}{(x+1)^2} = ?$

A) $-\infty$ B) -2 C) 0 D) 2 E) ∞

6. $\lim\limits_{x \to -\infty} ((x+2) \cdot (x^2 - 2x + 4)) = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) ∞

7. $\lim\limits_{x \to -\infty} (e^{-x} + 2) = ?$

A) $-\infty$ B) 0 C) e D) 2 E) ∞

8. $\lim\limits_{x \to -\infty} (3^x + 4^{\frac{1}{x}} + 2) = ?$

A) 0 B) 2 C) 3 D) 4 E) 5

9. $\lim\limits_{x\to\infty}\left(\frac{1}{2^x}+2^{\frac{1}{x}}\right)=?$

A) 0 B) 1 C) 2 D) 4 E) ∞

10. $\lim\limits_{x\to\infty}\left(\frac{2+3^{-x}}{1-3^{-x}}\right)=?$

A) $-\infty$ B) -2 C) 0 D) 2 E) ∞

11. $\lim\limits_{x\to\infty}\ln\left(e^2+\frac{1}{x}\right)=?$

A) $-\infty$ B) -2 C) 0 D) 2 E) ∞

12. $\lim\limits_{x\to\infty}\frac{\sin x}{x+1}=?$

A) $-\infty$ B) -1 C) 0 D) 1 E) ∞

13. $\lim\limits_{x\to\infty}\left[\frac{\cos(7x)}{x+7}\right]=?$

A) 0 B) 1 C) 7 D) 49 E) ∞

14. $\lim\limits_{x\to\infty}\frac{\sin(\pi x)}{4-x^2}=?$

A) $-\infty$ B) -1 C) 0 D) 1 E) π

15. $\lim\limits_{x\to\infty}\frac{\sin(4x)\cdot\cos(4x)}{4x}=?$

A) -1 B) 0 C) 1 D) 2 E) 4

16. $\lim\limits_{x\to-\infty}\log\left(-3x+\frac{4\cos(3x)}{|x+2|}\right)=?$

A) 0 B) 1 C) 5 D) 7 E) ∞

1. $\lim\limits_{x \to \infty} \left(\frac{2}{3}\right)^x = ?$

A) 0 B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) 1 E) ∞

2. $\lim\limits_{x \to \infty} \left(\frac{\pi}{e}\right)^{-x} = ?$

A) ∞ B) $\frac{\pi}{e}$ C) $\frac{1}{\pi}$ D) 0 E) $-\infty$

3. $\lim\limits_{x \to \infty} \left(-\frac{4}{5}\right)^{2x} = ?$

A) 0 B) $\frac{1}{4}$ C) $\frac{4}{5}$ D) 1 E) ∞

4. $a \in Z$

$\lim\limits_{x \to \infty} \left(\frac{a}{5}\right)^x = 0$

$\Rightarrow \min(a) = ?$

A) 4 B) 1 C) -1 D) -2 E) -4

5. $a \in Z$

$\lim\limits_{x \to \infty} \left(\frac{a}{4}\right)^{4x} = 0$

$\Rightarrow \max(a) = ?$

A) -3 B) -2 C) 0 D) 1 E) 3

6. $a \in Z$

$\lim\limits_{x \to \infty} \left(\frac{a}{6}\right)^{4x-1} = 0$

$\Rightarrow \max(a) = ?$

A) -5 B) -3 C) 0 D) 4 E) 5

7. $\lim\limits_{x \to \infty} \left(\frac{4}{5}\right)^{-x+1} = ?$

A) 0 B) $\frac{1}{5}$ C) $\frac{4}{5}$ D) $\frac{5}{4}$ E) ∞

8. $\lim\limits_{x \to \infty} \left(\frac{1}{3}\right)^{x-1} = ?$

A) 0 B) $\frac{1}{3}$ C) 3 D) 6 E) ∞

9. $\lim\limits_{x\to\infty} \dfrac{3^{x-1}}{4^{x+1}} = ?$

A) $-\dfrac{1}{12}$ B) 0 C) $\dfrac{1}{2}$ D) $\dfrac{2}{3}$ E) ∞

10. $\lim\limits_{x\to\infty} \dfrac{3^{1-x}}{4^{2-x}} = ?$

A) $-\dfrac{3}{4}$ B) $-\dfrac{1}{4}$ C) $-\dfrac{3}{2}$ D) 0 E) ∞

11. $\lim\limits_{x\to\infty} (2^{x+1} \cdot 9^{-x+1}) = ?$

A) 0 B) $\dfrac{1}{18}$ C) $\dfrac{1}{9}$ D) 18 E) ∞

12. $\lim\limits_{x\to\infty} (5^{-x} \cdot 3^{x-2}) = ?$

A) $-\dfrac{1}{9}$ B) 0 C) $\dfrac{1}{45}$ D) $\dfrac{1}{9}$ E) ∞

13. $\lim\limits_{x\to\infty} \left(\dfrac{4}{3}\right)^{x-2} = ?$

A) 0 B) $\dfrac{4}{3}$ C) $\dfrac{3}{4}$ D) 1 E) ∞

14. $\lim\limits_{x\to\infty} \left(\dfrac{2}{3}\right)^{3-x} = ?$

A) $-\dfrac{2}{3}$ B) $-\dfrac{4}{9}$ C) $-\dfrac{8}{27}$ D) 0 E) ∞

15. $\lim\limits_{x\to\infty} \dfrac{\left(\frac{1}{2}\right)^{x}}{2^{\frac{1}{x}}+2} = ?$

A) ∞ B) 2 C) $\dfrac{1}{2}$ D) $\dfrac{1}{4}$ E) 0

16. $\lim\limits_{x\to\infty} \dfrac{4^{-x}}{2^{\frac{2}{x}}-3} = ?$

A) ∞ B) 4 C) 2 D) 0 E) -2

1. $\lim\limits_{x \to \infty} \dfrac{4x-2}{2x+1} = ?$

A) ∞ B) 4 C) 2 D) 1 E) 0

2. $\lim\limits_{x \to \infty} \dfrac{5x+1}{2x^2+3x-1} = ?$

A) ∞ B) 5 C) 3 D) $\dfrac{5}{2}$ E) 0

3. $\lim\limits_{x \to \infty} \dfrac{3x^2-2x-4}{2x+1} = ?$

A) ∞ B) 3 C) 2 D) $\dfrac{3}{2}$ E) 0

4. $\lim\limits_{x \to -\infty} \dfrac{(3x^2-2)\cdot(4-x)}{7+x^2} = ?$

A) ∞ B) 2 C) 0 D) -2 E) $-\infty$

5. $\lim\limits_{x \to \infty} \dfrac{\sqrt{9x^2+4x-1}}{3x-2} = ?$

A) ∞ B) 3 C) 2 D) 1 E) 0

6. $\lim\limits_{x \to \infty} \dfrac{5x+\sqrt{x^2+3x+1}}{3x+2} = ?$

A) ∞ B) 5 C) $\dfrac{5}{3}$ D) 2 E) 0

7. $\lim\limits_{x \to \infty} \left(\log\sqrt{\dfrac{40000x+2}{4x-3}}\right) = ?$

A) 100 B) 10 C) 4 D) 2 E) 1

8. $\lim\limits_{x \to \infty} \dfrac{(2x+1)^4\cdot(5-x^3)^4}{x^4\cdot(x^3+1)^4} = ?$

A) $-\infty$ B) -16 C) 0 D) 16 E) ∞

9. $\lim\limits_{n\to\infty} \dfrac{5+9+13+...+(4n+1)}{3n^2+4} = ?$

A) 0 B) $\frac{2}{3}$ C) 1 D) $\frac{3}{4}$ E) $\frac{3}{2}$

10. $\lim\limits_{x\to-\infty} \dfrac{\sqrt{9x^2+5x-4}-4x}{\sqrt[3]{8x^3+3x+2}+5x} = ?$

A) -1 B) $-\frac{1}{2}$ C) $-\frac{4}{5}$ D) $-\frac{5}{4}$ E) 0

11. $\lim\limits_{x\to\infty} \left(\dfrac{3}{x^2-9}+\dfrac{2x+1}{x+3}\right) = ?$

A) ∞ B) 5 C) 3 D) 2 E) 1

12. $a, b, c \in R$

$b + 2c = 13$

$\lim\limits_{x\to\infty} \left(\dfrac{(a-4)x^3+(b-1)x^2+3ax-4}{cx^2-4bx-a}\right) = a$

$\Rightarrow a+b+c = ?$

A) 9 B) 12 C) 13 D) 15 E) 20

13. $\lim\limits_{x\to\infty} \left(\log_4\sqrt{16x^2+5}-\log_4(x+3)\right) = ?$

A) ∞ B) 9 C) 2 D) 1 E) 0

14. $\lim\limits_{x\to\infty} \dfrac{2^x+3x-\cos(5x)}{x^x+3x-2} = ?$

A) 0 B) 1 C) 3 D) 8 E) ∞

15. $\lim\limits_{x\to\infty} \dfrac{3^x-2^{x+1}}{3^{x+1}-2^{x-1}} = ?$

A) -3 B) $-\frac{1}{3}$ C) 0 D) $\frac{1}{3}$ E) 3

16. $\lim\limits_{x\to\infty} \dfrac{\cos x+x!}{9^x+11^x} = ?$

A) 0 B) $\frac{1}{9}$ C) $\frac{1}{11}$ D) 1 E) ∞

1. $\lim\limits_{x \to 3} \dfrac{x^2 - 9}{x - 3} = ?$

A) 0 B) 3 C) 6 D) 9 E) ∞

2. $\lim\limits_{x \to 1} \dfrac{x - 1}{x^3 - 1} = ?$

A) 0 B) $\dfrac{1}{3}$ C) 3 D) 6 E) ∞

3. $\lim\limits_{x \to 1} \dfrac{\sqrt{x} - 1}{\sqrt[3]{x} - 1} = ?$

A) 0 B) 1 C) $\dfrac{2}{3}$ D) $\dfrac{3}{2}$ E) 2

4. $\lim\limits_{x \to 1} \dfrac{x^2 - 3x + 2}{x^2 + 4x - 3} = ?$

A) $-\dfrac{1}{3}$ B) $-\dfrac{1}{4}$ C) 0 D) $\dfrac{1}{4}$ E) $\dfrac{1}{3}$

5. $\lim\limits_{x \to 3} \dfrac{x^4 - 18x^2 + 81}{x^3 - 27} = ?$

A) 4 B) 3 C) 1 D) 0 E) -3

6. $\lim\limits_{x \to -2} \dfrac{3x^4 \cdot (x + 2)^2}{x^4 + 2x^3 + 8x + 16} = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

7. $\lim\limits_{x \to 2} \dfrac{\sqrt{2}x - 2\sqrt{x}}{x - 2} = ?$

A) 0 B) $\dfrac{1}{\sqrt{2}}$ C) $\sqrt{2}$ D) $2\sqrt{2}$ E) ∞

8. $\lim\limits_{x \to 9} \dfrac{x - 9}{\sqrt{x} - 3} = ?$

A) 0 B) 3 C) 6 D) 12 E) 18

9. $k \in R$

$$\lim_{x \to 2} \frac{x^2 + ax + 6}{x^2 - x - 2} = k$$

$\Rightarrow a = ?$

A) -5 B) $-\frac{5}{2}$ C) 0 D) $\frac{2}{5}$ E) $\frac{5}{2}$

10. $k \in R$

$$\lim_{x \to -2} \frac{4 + mx}{x^2 + 7x + 10} = k$$

$\Rightarrow m = ?$

A) 5 B) 2 C) 1 D) -2 E) -5

11. $\lim_{x \to 2} \left(\frac{x}{2 - x} - \frac{8}{4 - x^2} \right) = ?$

A) $\frac{3}{2}$ B) 1 C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) $-\frac{3}{2}$

12. $\lim_{x \to -1} \left(\frac{1}{x + 1} + \frac{2}{x^2 - 1} \right) = ?$

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 1 D) $-\frac{1}{2}$ E) $-\frac{1}{4}$

13. $\lim_{x \to 4^+} \frac{\sqrt{x} - 2}{|x - 4|} = ?$

A) $\frac{1}{4}$ B) $\frac{3}{4}$ C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) $-\frac{1}{4}$

14. $\lim_{x \to 3^+} \frac{x - 3}{|x^2 - 9|} = ?$

A) $-\frac{1}{6}$ B) 0 C) $\frac{1}{8}$ D) $\frac{1}{6}$ E) $\varnothing$

15. $\lim_{x \to 0} \frac{\sqrt{x + 1} - 1}{x} = ?$

A) $-\frac{1}{4}$ B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 0 E) ∞

16. $\lim_{x \to 0^-} \frac{\sqrt{x + 1} - \sqrt{1 - x}}{x} = ?$

A) 0 B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) 1 E) ∞

1. $\lim\limits_{x \to 0} \dfrac{\sin(10x)}{2x} = ?$

A) 0 B) 1 C) 5 D) 10 E) ∞

2. $\lim\limits_{x \to 0} \dfrac{4x}{\sin(3x)} = ?$

A) 0 B) $\dfrac{4}{3}$ C) 1 D) 4 E) ∞

3. $\lim\limits_{x \to 0} \left(\dfrac{\sin(2x)}{x} + \dfrac{6x}{\sin(3x)}\right) = ?$

A) 3 B) 4 C) 5 D) 7 E) 12

4. $\lim\limits_{x \to 0} \dfrac{\sin^4(3x)}{x^4} = ?$

A) 243 B) 81 C) 27 D) 9 E) 3

5. $\lim\limits_{x \to 0} \dfrac{\sin^3(2x)}{3x^3} = ?$

A) 8 B) 4 C) 3 D) $\dfrac{8}{3}$ E) $\dfrac{2}{3}$

6. $\lim\limits_{x \to 0} \dfrac{3\sin(6x)}{\sin(3x)} = ?$

A) 1 B) 2 C) 3 D) 6 E) ∞

7. $\lim\limits_{x \to 0} \dfrac{\tan(6x)}{\tan(3x)} = ?$

A) 3 B) 2 C) 1 D) $\dfrac{1}{2}$ E) $\dfrac{1}{3}$

8. $\lim\limits_{x \to 0} \dfrac{\tan\sqrt{27x}}{\sqrt{\tan 9x}} = ?$

A) 1 B) $\sqrt{3}$ C) 3 D) $3\sqrt{3}$ E) 9

9. $\lim\limits_{x \to 2} \dfrac{\sin(x-2)}{x^2-4} = ?$

A) $\frac{1}{4}$ B) $\frac{1}{3}$ C) $\frac{1}{2}$ D) 1 E) ∞

10. $\lim\limits_{x \to 3} \dfrac{x^2-9}{\tan(\sqrt{x}-\sqrt{3})} = ?$

A) 27 B) $12\sqrt{3}$ C) 12 D) $6\sqrt{3}$ E) 3

11. $\lim\limits_{x \to y} \dfrac{\tan(x-y)}{x^2-y^2} = ?$

A) $-\frac{1}{2}$ B) $-\frac{1}{2x}$ C) $-\frac{1}{2y}$ D) $\frac{1}{2x}$ E) $\frac{1}{2y}$

12. $\lim\limits_{a \to -x} \dfrac{\sin(x^2-a^2)}{x^3+a^3} = ?$

A) $\frac{2}{a}$ B) $\frac{2}{3}$ C) $\frac{2}{3x}$ D) $\frac{2}{x}$ E) $\frac{2}{3a}$

13. $\lim\limits_{x \to 1} \left[\dfrac{(x^2-1)\cdot(x^2+x-2)}{\sin(x-1)\cdot\tan(3x-3)}\right] = ?$

A) 6 B) 4 C) 3 D) 2 E) 1

14. $\lim\limits_{x \to 0} \dfrac{\sin^3(2x)}{5x} = ?$

A) 0 B) $\frac{1}{5}$ C) $\frac{2}{5}$ D) $\frac{3}{5}$ E) ∞

15. $\lim\limits_{x \to 0} \dfrac{\tan^3(3x)}{2x} = ?$

A) $\frac{2}{3}$ B) 1 C) $\frac{3}{2}$ D) $\frac{1}{2}$ E) 0

16. $\lim\limits_{x \to 0} \dfrac{\tan(3x)}{\sin(2x)} = ?$

A) 3 B) 2 C) $\frac{3}{2}$ D) 1 E) $\frac{2}{3}$

1. $\lim\limits_{x \to 0} \left(\dfrac{1 - \cos(3x)}{x^2} \right) = ?$

A) 9 B) $\dfrac{9}{2}$ C) $\dfrac{3}{2}$ D) 1 E) 0

2. $\lim\limits_{x \to \frac{\pi}{8}} \left(\dfrac{1 - \tan(2x)}{\cos(2x) - \sin(2x)} \right) = ?$

A) $\sqrt{2}$ B) 1 C) 0 D) -1 E) $-\sqrt{2}$

3. $\lim\limits_{x \to 0} \left(\dfrac{\sin(3x) . \sin^3(2x)}{3x^4} \right) = ?$

A) 32 B) 16 C) 8 D) 4 E) 2

4. $\lim\limits_{x \to 0} \left(\dfrac{1 - \cos(6x)}{\sin^2(3x)} \right) = ?$

A) 8 B) 6 C) 4 D) 2 E) 1

5. $\lim\limits_{x \to 0} \left(\dfrac{\cos(4x) - \cos(8x)}{\sin x} \right) = ?$

A) 0 B) 1 C) 4 D) 8 E) ∞

6. $0 < x < \dfrac{\pi}{2}$

$\lim\limits_{x \to 0} \left(\dfrac{2\sqrt{1 - \sin x} - 2\sqrt{1 + \sin x}}{x} \right) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

7. $\lim\limits_{x \to a} \left(\dfrac{\cos(4x) - \cos(4a)}{4\sin(2a) \cdot \sin(a - x)} \right) = ?$

A) cos(2a) B) 2cos(2a) C) sin(2a) D) 2sin(2a) E) tan a

8. $\lim\limits_{x \to 0} \left(\dfrac{\sin(10x) - \sin(4x)}{\sin(3x)} \right) = ?$

A) 1 B) 2 C) 3 D) 5 E) 8

9. $\lim\limits_{x \to 0} \left(\dfrac{\sin(4x)}{2x + \tan(6x)} \right) = ?$

A) 3 B) 2 C) $\frac{2}{3}$ D) $\frac{1}{2}$ E) 0

10. $\lim\limits_{x \to 0} \left(\dfrac{3x + \sin(2x)}{2x - \sin(3x)} \right) = ?$

A) -5 B) -4 C) -1 D) $\frac{3}{2}$ E) $\frac{2}{3}$

11. $\lim\limits_{x \to 0} \left(\dfrac{6x^3 - 2\sin^3 x}{2x^4 + \sin^3 x} \right) = ?$

A) 0 B) 1 C) 2 D) 4 E) ∞

12. $\lim\limits_{x \to 0} \left(\dfrac{4\sin^2 x}{1 - \cos x} \right) = ?$

A) 8 B) 4 C) 2 D) $\frac{1}{2}$ E) 0

13. $\lim\limits_{x \to \infty} \left(\dfrac{\tan^2\left(\frac{2}{x}\right)}{\sin^2\left(\frac{4}{x}\right)} \right) = ?$

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 0 D) 2 E) 4

14. $\lim\limits_{x \to \pi} \left(\dfrac{\cos x + 1}{\sin^2 x} \right) = ?$

A) 0 B) $\frac{1}{2}$ C) 1 D) $\frac{3}{2}$ E) 2

15. $\lim\limits_{x \to \frac{\pi}{8}} \left(\dfrac{\cos(4x)}{\tan(2x) - 1} \right) = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) 1 E) 2

16. $\lim\limits_{x \to 0} \left(\dfrac{6x \cdot \tan(3x)}{\sin^2(3x)} \right) = ?$

A) 0 B) 1 C) 2 D) 3 E) ∞

1. $\lim\limits_{x\to\infty}\left(\sqrt{4x^2-6x+3}-2x+3\right)=?$

A) $-\frac{3}{2}$ B) 2 C) $\frac{5}{2}$ D) $\frac{3}{2}$ E) 3

2. $\lim\limits_{x\to\infty}\left(\sqrt{x^2+5x+8}-\sqrt{x^2+7x+3}\right)=?$

A) -3 B) -1 C) 0 D) 1 E) 2

3. $\lim\limits_{n\to\infty}\left(\sqrt{9n^2+4n}-\sqrt{9n^2-7}\right)=?$

A) $\frac{5}{2}$ B) 2 C) $\frac{3}{2}$ D) 1 E) $\frac{2}{3}$

4. $\lim\limits_{x\to\infty}\left(2x-\sqrt{4x^2+3}\right)=?$

A) $-\infty$ B) -1 C) 0 D) 1 E) ∞

5. $\lim\limits_{x\to-\infty}\left(\sqrt{x^2+4x+2}+x\right)=?$

A) -2 B) -1 C) 0 D) 1 E) ∞

6. $\lim\limits_{x\to\infty}\left(\sqrt{9x^2+4x-5}-2x\right)=?$

A) 0 B) $\frac{4}{9}$ C) 1 D) 9 E) ∞

7. $\lim\limits_{x\to\infty}\left(\sqrt{9x^2+3x-1}-\sqrt{4x^2+2}\right)=?$

A) $-\infty$ B) 0 C) 1 D) 9 E) ∞

8. $\lim\limits_{x\to\infty}\left(\sqrt{4x^2-2}-\sqrt{9x^2+6x-8}\right)=?$

A) $-\infty$ B) -4 C) -2 D) 1 E) 2

9. $\lim\limits_{x\to\infty}\left(\sqrt{x^2+ax-3}-x+1\right)=4$
$\Rightarrow a=?$

A) 0 B) 2 C) 4 D) 6 E) 8

10. $m, n \in R$
$\lim\limits_{x\to-\infty}\left(mx-3-\sqrt{4x^2+5}\right)=n$
$\Rightarrow m+n=?$

A) -5 B) -3 C) -2 D) -1 E) 1

11. $\lim\limits_{x\to0}\left(\frac{4}{x+4}-\frac{5}{x+5}\right)=?$

A) ∞ B) 5 C) 4 D) 0 E) $-\infty$

12. $\lim\limits_{x\to2}\left(\frac{1}{x-2}-\frac{4}{x^2-4}\right)=?$

A) 2 B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $\frac{1}{8}$ E) 0

13. $\lim\limits_{x\to3}\left(\frac{9}{x^3-27}-\frac{2}{x^2-9}\right)=?$

A) $-\frac{1}{9}$ B) $-\frac{1}{18}$ C) 0 D) $\frac{1}{18}$ E) 1

14. $\lim\limits_{x\to0}\left(\frac{1}{2^x-1}-\frac{2}{4^x-1}\right)=?$

A) $\frac{1}{8}$ B) $\frac{1}{4}$ C) $\frac{1}{2}$ D) 1 E) 2

15. $\lim\limits_{x\to\frac{3\pi}{2}}\left(\tan x+\sec x\right)=?$

A) ∞ B) 1 C) 0 D) -1 E) $-\infty$

16. $\lim\limits_{x\to0}\left(\operatorname{cosec} x-\cot x\right)=?$

A) 0 B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{2}{3}$ E) 1

1. $\lim\limits_{x\to\infty}\left(3x\cdot\sin\left(\frac{4}{x}\right)\right)=?$

A) $\frac{1}{4}$ B) $\frac{1}{3}$ C) 1 D) 4 E) 12

2. $\lim\limits_{x\to\infty}\left(4x\cdot\sin\left(\frac{\pi}{2x}\right)\right)=?$

A) 0 B) 1 C) 2 D) 2π E) $\frac{\pi}{4}$

3. $\lim\limits_{x\to\infty}\left(3x\cdot\tan\left(\frac{5}{3x}\right)\right)=?$

A) ∞ B) 5 C) 3 D) 1 E) 0

4. $\lim\limits_{x\to 0}(3x\cdot\cot(4x))=?$

A) 12 B) 4 C) $\frac{4}{3}$ D) 1 E) $\frac{3}{4}$

5. $\lim\limits_{x\to 3}((4x-12)\cdot\cot(2x-6))=?$

A) 6 B) 4 C) 3 D) 2 E) 1

6. $\lim\limits_{x\to 0}(6x\cdot\operatorname{cosec}(3x))=?$

A) 16 B) 4 C) 2 D) 1 E) 0

7. $\lim\limits_{x\to 0}\left(16x^9\cdot\operatorname{cosec}^3(2x^3)\right)=?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) 1 D) 2 E) 16

8. $\lim\limits_{a\to\infty}\left(\frac{a}{4}\cdot\sin\left(\frac{12}{a}\right)\right)=?$

A) 0 B) 1 C) 2 D) 3 E) 4

9. $\lim\limits_{x\to\infty}\left(\frac{x}{3}\cdot\tan\left(\frac{4}{x}\right)\right)=?$

A) $\frac{3}{4}$ B) 4 C) $\frac{4}{3}$ D) $\frac{1}{3}$ E) 0

10. $\lim\limits_{x\to\infty}\left(x^4\cdot\tan^3\left(\frac{2}{x}\right)\cdot\sin\left(\frac{3}{x}\right)\right)=?$

A) ∞ B) 32 C) 24 D) 9 E) 0

11. $\lim\limits_{x\to\infty}\left(1+\frac{3}{5x}\right)^{5x-2}=?$

A) 0 B) 1 C) 5 D) e^3 E) e^5

12. $\lim\limits_{x\to\infty}\left(1-\frac{4}{2x+3}\right)^{4+x}=?$

A) e^{-3} B) e^{-2} C) e^{-1} D) e E) e^2

13. $\lim\limits_{x\to\infty}\left(1+\frac{6}{x}\right)^{\frac{x}{3}+1}=?$

A) 1 B) e C) e^2 D) e^3 E) e^6

14. $\lim\limits_{x\to\infty}\left(\frac{3x+2}{3x-1}\right)^{2x+1}=?$

A) e B) e^2 C) e^3 D) e^6 E) e^{12}

15. $\lim\limits_{x\to\infty}\left(\frac{2x+1}{3x-4}\right)^{4x}=?$

A) ∞ B) 1 C) $\frac{2}{3}$ D) $\frac{16}{81}$ E) 0

16. $\lim\limits_{x\to\infty}\left(\frac{2x+3}{x+1}\right)^{3x}=?$

A) ∞ B) 8 C) 4 D) 2 E) 1

1. $f(x)=\begin{cases}3x+2 & x\geq 1\\ x^2+1 & x<1\end{cases}$

$\Rightarrow \lim\limits_{x\to 1^-} f(x)=?$

A) –1 B) 0 C) 1 D) 2 E) 5

2. $f(x)=\begin{cases}\dfrac{x+2}{x} & x>2\\ -2 & x=2\\ 6-2x & x<2\end{cases}$

$\Rightarrow \lim\limits_{x\to 2} f(x)=?$

A) ∅ B) –2 C) 1 D) 2 E) 3

3. $a\in R^-$

$k\in R$

$f(x)=\begin{cases}x^2+2ax & x\geq 2\\ \dfrac{x^4}{2x+4a} & x<2\end{cases}$

$\lim\limits_{x\to 2} f(x)=k$

$\Rightarrow a=?$

A) – 4 B) – 3 C) – 2 D) –1 E) 0

4. $k\in R$

$f(x)=\begin{cases}ax+1 & x\leq 2\\ 4x^2+3 & x>2\end{cases}$

$\Rightarrow \lim\limits_{x\to 2} f(x)=k$

$\Rightarrow a=?$

A) 4 B) 6 C) 8 D) 9 E) 10

5. $k\in R$

$f(x)=\begin{cases}ax-b & x>1\\ 3x+1 & x=1\\ 2x+a & x<1\end{cases}$

$\lim\limits_{x\to 1} f(x)=k$

$\Rightarrow b=?$

A) –3 B) –2 C) –1 D) 1 E) 2

6. $\lim\limits_{x\to 2}\dfrac{x+2}{(x-2)^2}=?$

A) – ∞ B) – 2 C) 2 D) 4 E) ∞

7. $\lim\limits_{x\to 1}\left(\dfrac{x+1}{x-1}\right)=?$

A) – ∞ B) 0 C) 4 D) ∅ E) ∞

8. $\lim\limits_{x\to 4}\dfrac{3x}{x^2-16}=?$

A) ∅ B) – ∞ C) –12 D) 12 E) ∞

9. $\lim\limits_{x \to 3} (|x+2|+|x-2|) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

10. $\lim\limits_{x \to 2^-} |x^2-4| = ?$

A) –1 B) 0 C) 3 D) 6 E) 8

11. $\lim\limits_{x \to 0^+} \left(\frac{|x|}{x} - 3x + 4\right) = ?$

A) 2 B) 4 C) 5 D) 6 E) 8

12. $\lim\limits_{x \to -2^-} \frac{|x^2-4|}{x+2} = ?$

A) – 4 B) – 2 C) 0 D) 2 E) 4

13. $\lim\limits_{x \to 4^+} \left(\frac{|x-4|}{x-4} + x\right) = ?$

A) 6 B) 5 C) 4 D) 0 E) –1

14. $\lim\limits_{x \to 1} (|x-1|+x-1) = ?$

A) ∅ B) –3 C) –1 D) 0 E) 1

15. $\lim\limits_{x \to 3} \frac{|x+3|}{x-3} = ?$

A) –1 B) 0 C) 1 D) ∞ E) ∅

16. $\lim\limits_{x \to -5^-} \frac{|x+5|}{-x-5} = ?$

A) ∅ B) –1 C) 0 D) 1 E) 4

1. $f(x)=\begin{cases}3x-2 & x>3\\ a & x=3\\ 2x+1 & x<3\end{cases}$

$\lim\limits_{x\to 3} f(x)=f(3)$

$\Rightarrow a=?$

A) 4 B) 5 C) 7 D) 8 E) 9

2. $f(x)=\begin{cases}2x^2-3 & x<2\\ m & x=2\\ x^2+1 & x>2\end{cases}$

$\lim\limits_{x\to 2} f(x)=f(2)$

$\Rightarrow m=?$

A) -1 B) 0 C) 1 D) 3 E) 5

3. $f(x)=\begin{cases}3x+a & x\geq 1\\ \dfrac{4x-5}{x-2} & x<1\end{cases}$

$\lim\limits_{x\to 1} f(x)=f(1)$

$\Rightarrow a=?$

A) -4 B) -2 C) 0 D) 2 E) 4

4. $f(x)=\begin{cases}x^4-2 & x>1\\ 3-a & x=1\\ 3x-4 & x<1\end{cases}$

$\lim\limits_{x\to 1} f(x)=f(1)$

$\Rightarrow a=?$

A) 4 B) 2 C) 1 D) 0 E) -1

5. $f(x)=\begin{cases}2x+b & x<-1\\ 5 & x=-1\\ -3x+a & x>-1\end{cases}$

$\lim\limits_{x\to -1} f(x)=f(-1)$

$\Rightarrow a+b=?$

A) 2 B) 3 C) 5 D) 7 E) 9

6. $a, b\in R$

$f(x)=\begin{cases}\dfrac{2x^2-a}{x-1} & x\neq 1\\ b & x=1\end{cases}$

$\lim\limits_{x\to 1} f(x)=f(1)$

$\Rightarrow a+b=?$

A) -2 B) -1 C) 2 D) 4 E) 6

7. $f(x)=\begin{cases}2^{x-a} & x<2\\ 8 & x=2\\ 3x+2 & x>2\end{cases}$

$\lim\limits_{x\to 2} f(x)=f(2)$

$\Rightarrow a=?$

A) -1 B) 0 C) 1 D) 2 E) 3

8. $f(x)=\begin{cases}m & x\leq -2\\ 4x-2 & x>-2\end{cases}$

$\lim\limits_{x\to -2} f(x)=f(-2)$

$\Rightarrow m=?$

A) -9 B) -10 C) -11 D) -12 E) -13

9. $f(x)=\begin{cases}2x^2-5 & x<2\\ a & x\geq 2\end{cases}$

$\lim\limits_{x\to 2} f(x)=f(2)$

$\Rightarrow a=?$

A) –3 B) –2 C) 0 D) 2 E) 3

10. $f(x)=\begin{cases}4x+2 & x>1\\ 3a-6 & x\leq 1\end{cases}$

$\lim\limits_{x\to 1} f(x)=f(1)$

$\Rightarrow a=?$

A) 4 B) 2 C) 0 D) –1 E) –4

11. $f(x)=\begin{cases}3\sin(2x)-a & x<\frac{\pi}{4}\\ 2\cos(4x)+4 & x\geq\frac{\pi}{4}\end{cases}$

$\lim\limits_{x\to\frac{\pi}{4}} f(x)=f\left(\frac{\pi}{4}\right)$

$\Rightarrow a=?$

A) –1 B) 0 C) 1 D) 2 E) 3

12. $f(x)=\begin{cases}3x+b & x>2\\ 7 & x=2\\ ax+3 & x<2\end{cases}$

$\lim\limits_{x\to 2} f(x)=f(2)$

$\Rightarrow a+b=?$

A) 3 B) 2 C) 1 D) –1 E) –2

13. $f(x)=\begin{cases}x^3+a & x>-1\\ 4 & x=-1\\ b-2x & x<-1\end{cases}$

$\lim\limits_{x\to -1} f(x)=f(-1)$

$\Rightarrow a\cdot b=?$

A) 13 B) 10 C) –3 D) –10 E) –13

14. $f(x)=\begin{cases}ax+b & x>1\\ -2 & x=1\\ 3x^3+5b & x<1\end{cases}$

$\lim\limits_{x\to 1} f(x)=f(1)$

$\Rightarrow a=?$

A) –2 B) –1 C) 0 D) 1 E) 2

15. $f(x)=\begin{cases}3x-4 & x\geq 2\\ 10-ax^2 & x<2\end{cases}$

$\lim\limits_{x\to 2} f(x)=f(2)$

$\Rightarrow a=?$

A) 0 B) 1 C) 2 D) 3 E) 4

16. $f(x)=\begin{cases}3x^2+k & x>a\\ 2k & x=a\\ 3ax+4 & x<a\end{cases}$

$\lim\limits_{x\to a} f(x)=f(a)$

$\Rightarrow f(a)+k=?$

A) 2 B) 4 C) 8 D) 12 E) 16

1. $f(x) = \begin{cases} mx+n & x>1 \\ 6 & x=1 \\ 2x^2+n & x<1 \end{cases}$

$\lim\limits_{x\to 1} f(x) = f(1)$

$\Rightarrow m-n = ?$

A) 8 B) 4 C) 2 D) –2 E) –4

2. $f(x) = \begin{cases} 3x+1 & x\le 2 \\ mx+n & 2<x<4 \\ 4x-3 & x\ge 4 \end{cases}$

$\lim\limits_{x\to 2} f(x) = f(2)$

$\lim\limits_{x\to 4} f(x) = f(4)$

$\Rightarrow m-n = ?$

A) – 5 B) – 1 C) 1 D) 2 E) 5

3. $a \in R$

$f(x) = 2^{\frac{1}{x-2}}$

$\lim\limits_{x\to a} f(x) \ne f(a)$

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

4. $a \in R$

$f(x) = \dfrac{3x-5}{x-4}$

$\lim\limits_{x\to a} f(x) \ne f(a)$

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

5. $a \in R$

$f(x) = \dfrac{3x+2}{x^2-4}$

$\lim\limits_{x\to a} f(x) \ne f(a)$

$\Rightarrow a = ?$

A) {2, 3} B) {– 2, 2} C) {– 3, 3} D) {0, 2} E) {1, 2}

6. $0 \le a \le \pi$

$f(x) = \dfrac{\sin x}{2\cos x - 1}$

$\lim\limits_{x\to a} f(x) \ne f(a)$

$\Rightarrow a = ?$

A) $\frac{\pi}{4}$ B) $\frac{\pi}{3}$ C) $\frac{2\pi}{3}$ D) $\frac{5\pi}{6}$ E) 0

7. $a \in R$

$f(x) = \begin{cases} 4 & x<2 \\ \dfrac{8}{6-x^2} & x\ge 2 \end{cases}$

$\lim\limits_{x\to a} f(x) \ne f(a)$

$\Rightarrow a = ?$

A) –2 B) 2 C) 3 D) $-\sqrt{6}$ E) $\sqrt{6}$

8. $a \in R$

$f(x) = \begin{cases} -\dfrac{1}{3x} & x>1 \\ \dfrac{1}{x^2-4} & x\le 1 \end{cases}$

$\lim\limits_{x\to a} f(x) \ne f(a)$

$\Rightarrow a = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

9. $a \in R$

$$f(x) = \begin{cases} \dfrac{2x+1}{x^2-4} & x < 4 \\ \dfrac{3x-1}{5} & x \geq 4 \end{cases}$$

$\lim\limits_{x \to a} f(x) \neq f(a)$

$\Rightarrow a = ?$

A) {1, 5} B) {−1, 1} C) {2, 3} D) {−2, 2, 4} E) {0, 1}

10. $a \in R$

$$f(x) = \begin{cases} \dfrac{3}{x-5} & x > 5 \\ \dfrac{2x+1}{x^2-1} & x \leq 5 \end{cases}$$

$\lim\limits_{x \to a} f(x) \neq f(a)$

$\Rightarrow a = ?$

A) {5} B) {−1, 1} C) {−1, 5} D) {1, 5} E) {−1, 1, 5}

11. $a \in R$

$$f(x) = \begin{cases} \dfrac{3x}{4} & x > -1 \\ \dfrac{6}{x^2+2} & x \leq -1 \end{cases}$$

$\lim\limits_{x \to a} f(x) \neq f(a)$

$\Rightarrow a = ?$

A) {−2} B) {−1} C) {0} D) {1} E) {4}

12. $$f(x) = \begin{cases} 2x+4 & x \leq 0 \\ ax+b & 0 < x < 2 \\ x^2-1 & x \geq 2 \end{cases}$$

$\lim\limits_{x \to 0} f(x) = f(0)$

$\lim\limits_{x \to 2} f(x) = f(2)$

$\Rightarrow a + b = ?$

A) $-\frac{3}{2}$ B) $-\frac{1}{2}$ C) -1 D) $\frac{7}{2}$ E) 4

13. $$f(x) = \begin{cases} x^3 & x \leq 2 \\ x^2+a & x > 2 \end{cases}$$

$\lim\limits_{x \to 2} f(x) = f(2)$

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

14. $$f(x) = \begin{cases} x^2+1 & x = -2 \\ x^3+a & x \neq -2 \end{cases}$$

$\lim\limits_{x \to -2} f(x) = f(-2)$

$\Rightarrow a = ?$

A) 5 B) 7 C) 9 D) 10 E) 13

15. $$f(x) = \begin{cases} 4x+3 & x < 0 \\ a+4 & x = 0 \\ x^3+3 & x > 0 \end{cases}$$

$\lim\limits_{x \to 0} f(x) = f(0)$

$\Rightarrow a = ?$

A) 3 B) 2 C) 1 D) 0 E) −1

16. $$f(x) = \begin{cases} \dfrac{x^2+a}{x+2} & x \neq -2 \\ -4 & x = -2 \end{cases}$$

$\lim\limits_{x \to -2} f(x) = f(-2)$

$\Rightarrow a = ?$

A) −4 B) −3 C) −2 D) 2 E) 4

1. $\lim\limits_{x \to 3} \operatorname{sgn}(x-2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

2. $\lim\limits_{x \to 2} \dfrac{\operatorname{sgn}(x+1)}{\operatorname{sgn}(x-1)} = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

3. $\lim\limits_{x \to 0} \operatorname{sgn}(x+3) = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) $\varnothing$

4. $\lim\limits_{x \to 2} \operatorname{sgn}(x^2-4x-5) = ?$

A) -2 B) -1 C) 0 D) 1 E) $\varnothing$

5. $\lim\limits_{x \to 2} \left(|x-1|+|x+1| \cdot \operatorname{sgn}(2-x)\right) = ?$

A) $\varnothing$ B) -6 C) -2 D) 2 E) 6

6. $\lim\limits_{x \to e^+} \dfrac{\operatorname{sgn}(-1+\ln x)}{\ln x} = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) ∞

7. $\lim\limits_{x \to 1} \dfrac{\operatorname{sgn}(x-1)}{x+1} = ?$

A) ∞ B) 1 C) 0 D) -1 E) $\varnothing$

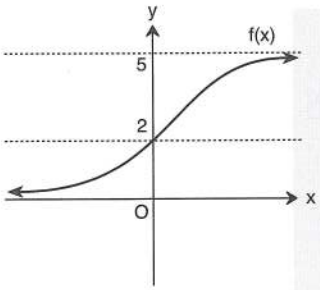
8. $\lim\limits_{x \to \frac{\pi}{2}} \dfrac{\operatorname{sgn}(\cos x)}{\sin x} = ?$

A) $\varnothing$ B) -1 C) 0 D) 1 E) ∞

9. $\operatorname{sgn}\left(\lim\limits_{x\to 0}\left(\dfrac{5x+\sin(5x)}{3x+\sin(3x)}\right)\right)=?$

A) -2 B) -1 C) 0 D) 1 E) 2

10.



$\Rightarrow \lim\limits_{x\to\infty} [\![f(x)-7]\!] + \lim\limits_{x\to-\infty} \operatorname{sgn}(f(x)-3)=?$

A) -6 B) -5 C) -4 D) -3 E) -2

11. $\lim\limits_{x\to 1}\dfrac{\operatorname{sgn}(x-1)}{\operatorname{sgn}(1-x)}=?$

A) $-\infty$ B) -1 C) 0 D) ∞ E) $\varnothing$

12. $\lim\limits_{x\to 1}\left(|x^2-3|+\operatorname{sgn}(5-x)\right)=?$

A) 3 B) 2 D) 1 E) 0 E) -1

13. $\lim\limits_{x\to 2^+}\left(\dfrac{3}{\operatorname{sgn}(x^2-4)}+\dfrac{5}{2+[\![x+1]\!]}\right)=?$

A) 5 B) 4 C) 3 D) 2 E) 1

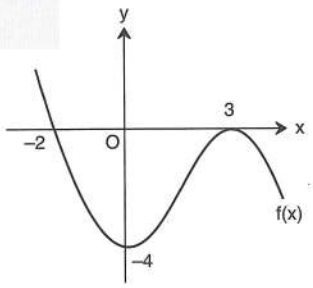
14. $\lim\limits_{x\to -\pi}\left([\![|x|]\!]-|\operatorname{sgn}(x)|+\left[\!\left[\dfrac{x}{2}\right]\!\right]\right)=?$

A) 7 B) 5 C) 3 D) 1 E) 0

15. $\lim\limits_{x\to 4^+}\left((3x-2).[\![x-4]\!]-x^2\cdot\operatorname{sgn}(x^2-16)\right)=?$

A) -19 B) -16 C) 8 D) 16 E) 20

16.



$\Rightarrow \lim\limits_{x\to 0} [\![f(x)\cdot \operatorname{sgn} f(x)]\!]=?$

A) 5 B) 4 C) 3 D) -3 E) -4

1. $\lim\limits_{x \to 0^+} (\llbracket x+2 \rrbracket^{\llbracket x \rrbracket} - 3) = ?$

A) -2 B) -1 C) 0 D) 1 E) Ø

2. $\lim\limits_{x \to 3} \llbracket x+4 \rrbracket = ?$

A) 5 B) 6 C) 7 D) 8 E) Ø

3. $\lim\limits_{x \to -2} \left\llbracket x - \frac{3}{2} \right\rrbracket = ?$

A) -5 B) -4 C) -3 D) -2 E) -1

4. $\lim\limits_{x \to 3^+} \frac{\llbracket x^2 \rrbracket}{x-3} = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) ∞

5. $\lim\limits_{x \to \infty} \frac{x}{\llbracket x \rrbracket} = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) $+\infty$

6. $\lim\limits_{x \to 2^-} \frac{\llbracket 2x - \llbracket x+3 \rrbracket \rrbracket}{3-x} = ?$

A) -3 B) -2 C) -1 D) 0 E) 1

7. $\lim\limits_{x \to \infty} \frac{\llbracket x-1 \rrbracket \cdot \llbracket x+1 \rrbracket}{\llbracket x \rrbracket} = ?$

A) $-\infty$ B) -1 C) 0 D) 1 E) ∞

8. $\lim\limits_{x \to \frac{61\pi}{3}} (\llbracket \sin x \rrbracket \cdot \cos x) = ?$

A) $-\frac{\sqrt{3}}{2}$ B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{2}$

9. $\lim\limits_{x \to 0^+} (1998^{[\![x]\!]} - 1) = ?$

A) 0 B) 1 C) 2 D) 1997 E) 1998

10. $\lim\limits_{x \to 3^+} \dfrac{[\![2-3x]\!]}{x-3} = ?$

A) $-\infty$ B) -2 C) 1 D) 2 E) ∞

11. $\lim\limits_{x \to -2^-} 2^{[\![4x]\!]} = ?$

A) $\dfrac{1}{512}$ B) $\dfrac{1}{256}$ C) $\dfrac{1}{128}$ D) $\dfrac{1}{64}$ E) $\dfrac{1}{32}$

12. $\lim\limits_{x \to 3^+} \left[\!\left[3x - \left[\!\left[x + \dfrac{1}{2}\right]\!\right]\right]\!\right] = ?$

A) 4 B) 5 C) 6 D) 7 E) 8

13. $\lim\limits_{x \to 2^+} \dfrac{x \cdot [\![2x]\!] - 2\operatorname{sgn}(x-2)}{x} = ?$

A) -3 B) -2 C) 1 D) 3 E) 5

14. $\lim\limits_{x \to 5} \sqrt{[\![x+5]\!] - \operatorname{sgn}(x)} = ?$

A) $\varnothing$ B) 2 C) 3 D) 4 E) 5

15. $\lim\limits_{x \to \frac{\pi}{2}^+} \dfrac{\operatorname{sgn}(\tan x)}{[\![\tan x]\!] + \operatorname{sgn}(\cos x)} = ?$

A) -1 B) $-\dfrac{1}{2}$ C) 0 D) 1 E) 2

16. $\lim\limits_{x \to -\frac{5}{2}} \dfrac{\dfrac{|x-2|}{x-2} - 2[\![x]\!]}{\operatorname{sgn}(x)} = ?$

A) -5 B) -3 C) -1 D) 2 E) 4

1. $\lim\limits_{x \to 3} (x^2 + 2x - 10) = ?$

A) -5 B) -3 C) 0 D) 3 E) 5

2. $\lim\limits_{x \to a} (4x - 3) = 9$

$\Rightarrow a = ?$

A) 6 B) 5 C) 3 D) 2 E) 1

3. $\lim\limits_{x \to -2} (-x^2 + x + 5)^{99} = ?$

A) -1 B) 0 C) 1 D) 2^{100} E) 2^{99}

4. $\lim\limits_{x \to \frac{\pi}{6}} \dfrac{3 \cdot \sin(2x) - 3}{\cos x - 1} = ?$

A) $-\dfrac{\sqrt{3}}{2}$ B) $-\dfrac{1}{2}$ C) 0 D) $\dfrac{\sqrt{3}}{2}$ E) 3

5. $\lim\limits_{x \to e+2} \dfrac{\ln(\ln(x-2))}{e - x} = ?$

A) $-\infty$ B) $-e$ C) -1 D) 0 E) e

6. $\lim\limits_{x \to \infty} \left(\sqrt{4x^2 + 2x - 1} - 2x\right) = ?$

A) $\dfrac{1}{3}$ B) $\dfrac{1}{2}$ C) $\dfrac{2}{3}$ D) 1 E) 2

7. $a > 3$

$\Rightarrow \lim\limits_{x \to \infty} \dfrac{2e^{x+4} - a^{x+4}}{a^{x+4} - 2e^{x+4}} = ?$

A) ∞ B) 1 C) $\dfrac{1}{2}$ D) -1 E) $-\infty$

8. $\lim\limits_{x \to \infty} \left(e^{-2x^2 - 3x - 4}\right) = ?$

A) $-\infty$ B) $-e$ C) 0 D) e E) ∞

9. $\lim\limits_{x\to\infty} \dfrac{2x^2-3x+4}{5x^2-4x-2} = ?$

A) $\frac{2}{5}$ B) $\frac{1}{5}$ C) $\frac{3}{4}$ D) $\frac{5}{2}$ E) 2

10. $\lim\limits_{x\to 2} \dfrac{x^2+3x-10}{x^2-4} = ?$

A) 1 B) $\frac{2}{5}$ C) $\frac{7}{4}$ D) 2 E) ∞

11. $\lim\limits_{x\to 2} \dfrac{x^3-4x}{x^2-2} = ?$

A) $-\frac{1}{4}$ B) -1 C) 0 D) $\frac{1}{2}$ E) $\frac{1}{4}$

12. $\lim\limits_{x\to 4} \left(\dfrac{1}{x-4} - \dfrac{8}{x^2-16}\right) = ?$

A) $\frac{1}{8}$ B) $\frac{1}{4}$ C) 1 D) 2 E) 8

13. $\lim\limits_{x\to\infty} \left(1+\dfrac{4}{3x+2}\right)^{6x+4} = ?$

A) e^8 B) e^4 C) e D) 2 E) 6

14. $\lim\limits_{x\to 4} \dfrac{x^2-25}{\sin\left(\frac{3\pi}{8}x\right)} = ?$

A) 9 B) 5 C) 1 D) -2 E) -9

15. $\lim\limits_{x\to\infty} \dfrac{3^{x+1}+3^{-x}}{3^x+3^{-x}} = ?$

A) 3 B) $\frac{3}{2}$ C) 1 D) $\frac{1}{3}$ E) $\frac{1}{2}$

16. $\lim\limits_{x\to-\infty} \left(2^{\frac{3}{x}}+5^x+3\right) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

1. $f(x)=\begin{cases} -2x & x<2 \\ 5 & x=2 \\ -3x+2 & x>2 \end{cases}$

$\Rightarrow \lim\limits_{x\to 1} f(x) = ?$

A) –4 B) –2 C) 2 D) 5 E) ∅

2. $f(x)=\begin{cases} 2x+5 & x\neq 3 \\ 0 & x=3 \end{cases}$

$\Rightarrow \lim\limits_{x\to 3} f(x) = ?$

A) 11 B) 5 C) 3 D) 1 E) 0

3. $\lim\limits_{x\to 3^+}\left(\dfrac{|x-3|}{x-3}-2x+4\right)=?$

A) 3 B) 2 C) 1 D) –1 E) – 2

4. $\lim\limits_{x\to 3}\left(\log_5(2x^2+7)\right)=?$

A) 1 B) 2 C) 3 D) 4 E) 7

5. $\lim\limits_{x\to 4}\dfrac{x^3-4x^2-2x+8}{x^2-x-12}=?$

A) 1 B) 2 C) 3 D) 4 E) 5

6. $\lim\limits_{x\to 3}\dfrac{x^3-27}{x^2+3x-18}=?$

A) 0 B) 1 C) 2 D) 3 E) 4

7. $\lim\limits_{x\to \frac{\pi}{6}}\dfrac{\sin x-\cos(2x)}{x-\pi}=?$

A) $\frac{1}{4}$ B) $\frac{\sqrt{3}}{4}$ C) $\frac{3}{2}$ D) $\frac{1}{2}$ E) 0

8. $\lim\limits_{x\to 1}\dfrac{x^6-1}{2x-2}=?$

A) 6 B) 3 C) 2 D) 1 E) 0

9. $\lim\limits_{x \to 3} \dfrac{\sqrt{4x-3}-3}{x^2-9} = ?$

A) $\frac{1}{3}$ B) $\frac{1}{4}$ C) $\frac{1}{6}$ D) $\frac{1}{9}$ E) $\frac{1}{27}$

10. $\lim\limits_{x \to 2} \dfrac{|x+1|+|x-3|-2x}{x^2-2x} = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

11. $\lim\limits_{x \to 8} \left(3x^{\frac{2}{3}} + 2\sqrt{2x} + 5\right)^{\frac{1}{2}} = ?$

A) 1 B) 3 C) 5 D) 8 E) 12

12. $\lim\limits_{x \to -4} \left(\dfrac{3}{x+4} + \dfrac{24}{x^2-16}\right) = ?$

A) $\frac{3}{8}$ B) $\frac{1}{8}$ C) 0 D) $-\frac{1}{8}$ E) $-\frac{3}{8}$

13. $\lim\limits_{x \to 16} \dfrac{\sqrt[4]{x} - 2\sqrt[3]{2}}{\sqrt[3]{x} - 2} = ?$

A) $-2\sqrt[3]{2}$ B) -2 C) -1 D) 0 E) $2\sqrt[3]{2}$

14. $a, b \in R$

$\lim\limits_{x \to \infty} \left(\dfrac{(a-2)x^3 + (b+1)x^2 + 3}{x^2 - 7x + 8}\right) = 4$

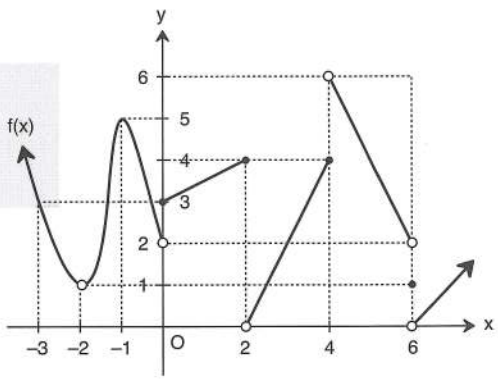
$\Rightarrow a + b = ?$

A) 0 B) 1 C) 2 D) 4 E) 5

15. $\lim\limits_{x \to \infty} \left(\sqrt{9x^2 + 12x - 8} - 3x\right) = ?$

A) 1 B) $\frac{3}{2}$ C) 2 D) $\frac{5}{2}$ E) 3

16.



$\lim\limits_{x \to -3} f(x) + \lim\limits_{x \to -2} f(x) + \lim\limits_{x \to -1} f(x) + \lim\limits_{x \to 0^+} f(x) = a$

$\lim\limits_{x \to 2^-} f(x) + \lim\limits_{x \to 4^+} f(x) + \lim\limits_{x \to 6^-} f(x) = b$

$\Rightarrow a + b = ?$

A) 15 B) 17 C) 19 D) 23 E) 24

LİMİT
LIMIT

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	C	B	D	C	A	B	E	D	B	B	C	D	B	E	E

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	C	B	D	E	A	B	D	B	B	D	C	A	E	A

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	A	E	E	C	A	E	C	B	D	D	C	A	C	B	E

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	D	A	E	E	E	E	A	B	E	A	B	E	E	E	D

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	A	A	D	D	D	D	B	A	D	D	D	A	D	E

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	D	C	D	D	B	C	A	B	E	D	A	D	C	D

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	B	B	D	D	B	B	A	B	E	C	D	A	E	C

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	C	D	A	A	B	B	D	A	D	A	A	B	A	C

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	E	C	A	E	E	A	D	A	D	C	B	C	C	A

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	D	B	E	D	C	D	D	C	C	D	B	C	B	E	A

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	C	D	B	E	D	A	E	B	C	A	B	D	E	D

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	B	A	E	E	A	B	E	A	C	A	B	B	C	D

TEST 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	B	D	B	B	E	A	D	E	B	D	D	E	E	A

TEST 14

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	D	B	A	D	E	A	D	C	B	A	B	E	B	C

TEST 15

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	B	E	D	C	E	C	A	A	A	C	D	A	C	A

TEST 16

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	C	A	E	D	B	D	C	A	C	C	A	A	A	A	D

TEST 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	D	B	B	D	E	B	D	B	C	E	C	E	C	E

DİZİLER ve SERİLER

SEQUENCES AND SERIES

DİZİLER VE SERİLER

TANIM | Definition

Dizi | Sequence

Tanım kümesi, sayma sayıları kümesi (N^+) olan her fonksiyona dizi denir.

Each functions with a domain of counting numbers (N^+) is called sequence

$f: N^+ \longrightarrow R$

$f(n) = a_n$

- a_n : Dizinin n. terimi veya dizinin genel terimi

  n^{th} term of the sequence or the general term of the sequence.

- $n \in N^+$

$a_n = k$ ve $k \in R$ ise diziye sabit dizi denir.

$a_n = k$ and $k \in R$ is called constant sequence.

1. $a_n = \left(\dfrac{4n-1}{n+2}\right)$

$\Rightarrow a_7 = ?$

$\boxed{3}$

2. $a_n = \left(\dfrac{6+3n}{n+5}\right)$

$a_k = 2$

$\Rightarrow k = ?$

$\boxed{4}$

3. $a_n = \dfrac{2^n (n+1)!}{n}$

$\Rightarrow \dfrac{a_{n+1}}{a_n} = ?$

$\boxed{\dfrac{2n \cdot (n+2)}{n+1}}$

4. $a_n = \begin{cases} n-4 & \text{n tek (odd)} \\ 2n+7 & \text{n çift (even)} \end{cases}$

$\Rightarrow a_7 - a_{10} = ?$

$\boxed{-24}$

5. $a_n = \left(\dfrac{n+4}{k-3n}\right)$

$a_6 = 10$

$\Rightarrow k = ?$

$\boxed{19}$

6. $a_{n+5} = \dfrac{3+4 \cdot a_n}{5}$

$a_1 = 2$

$\Rightarrow a_{11} = ?$

$\boxed{\dfrac{59}{25}}$

7. $a_n = \left(\dfrac{2n}{n-4}\right)$

$b_n = \left(\dfrac{8}{4-n}\right)$

$\Rightarrow a_n + b_n = ?$

$\boxed{2}$

8. $a_{n+2} = \dfrac{3^n}{(n+2)!}$

$\Rightarrow \dfrac{a_n}{a_{n+1}} = ?$

$\boxed{\dfrac{n+1}{3}}$

9. $a_{n+1} = \left(\dfrac{10-n}{n+3}\right) \cdot a_n$

$a_1 = 2$

$\Rightarrow a_5 = ?$

$\boxed{\dfrac{36}{5}}$

10. $a_n = 3n^2 - 1$

$\Rightarrow a_7 + a_8 - 2a_5 = ?$

$\boxed{189}$

11. $a_n = (-1)^n \cdot \left(\dfrac{3}{4}\right)^n \cdot n!$

$\Rightarrow \dfrac{a_{n+2}}{a_{n+1}} = ?$

$\boxed{-\dfrac{3}{4} \cdot (n+2)}$

12. $a_1 = 2$

$a_{n+1} = \sqrt{7 + a_n}$

$\Rightarrow a_3 = ?$

$\sqrt{10}$

13. $a_n = \left(\frac{(-1)^n}{n+3}\right)$

$\Rightarrow a_1 + a_2 + a_3 = ?$

$-\frac{13}{60}$

14. $a_n = \frac{5-n}{n} \cdot a_{n-2}$

$\Rightarrow a_9 = ?$

0

15. $a_n = \begin{cases} \frac{n^2+7}{2n} & \text{n tek (odd)} \\ \frac{2n+4}{n^2-5} & \text{n çift (even)} \end{cases}$

$\Rightarrow \frac{a_7}{a_4} = ?$

$\frac{11}{3}$

16. $a_n = \left(\frac{4n+k}{n-\frac{2}{3}}\right)$

$a_8 = 6$

$\Rightarrow k = ?$

12

17. $a_n = \left(\frac{2n+5}{n+2}\right)$

$b_n = \left(\frac{p \cdot n + 10}{q \cdot n + 8}\right)$

$a_n = b_n$

$\Rightarrow p + q = ?$

8

18. $2 \cdot a_n = a_{n+1}$

$a_1 + a_2 + a_3 = 21$

$\Rightarrow a_1 = ?$

3

19. $a_{n+2} = \frac{n!}{n^n}$

$\Rightarrow \frac{a_4}{a_6} = ?$

$\frac{16}{3}$

20. $a_n = \frac{(n-k+2)}{11}$

$a_6 = 2$

$\Rightarrow k = ?$

-14

21. $a_n = \log\left(\frac{n^2}{n+1}\right)$

$\Rightarrow a_2 + a_3 = ?$

log3

22. $a_n = \sum_{k=1}^{n} k^2$

$\Rightarrow a_6 = ?$

91

23. $a_{n+2} = \frac{2n+5}{n+2}$

$\Rightarrow a_n = ?$

$\frac{2n+1}{n}$

DİZİLER VE SERİLER

ÖZELLİK | Property 1

Aritmetik Dizi | Arithmetical Sequence

(a_n) bir dizi olmak üzere $\forall n \in N^+$ için;

(a_n) is a sequence and for $\forall n \in N^+$;

$$a_n - a_{n-1} = d$$

ise (a_n) dizisine aritmetik dizi, d'ye de ortak fark denir.

(a_n) sequences is called arithmetical sequence, d is called common difference.

$$a_n = a_1 + (n-1) \cdot d$$

$$a_n = a_p + (n-p) \cdot d$$

$$a_n = \frac{a_{n+p} + a_{n-p}}{2}$$

$$S_n = \sum_{k=1}^{n} a_k$$

kısmi toplamlar dizisi *(partical sum)*

$$S_n = \frac{n}{2}(a_1 + a_n)$$

Aşağıda verilen diziler aritmetik dizidir.

The sequences below are the arithmetical sequence.

1. $a_1 = -5$
$d = 5$
$\Rightarrow a_n = ?$

$5n - 10$

2. $\dfrac{a_9 - 2a_6 + a_{12}}{a_4 - a_1} = ?$

3

3. $a_1 = 14$
$d = 3$
$\Rightarrow a_{10} = ?$

41

4. $a_1 = 8x - 7$
$a_2 = x + 6$
$a_3 = 2x - 5$
$\Rightarrow a_6 = ?$

-23

5. $a_1 = -20$
$a_k = -100$
$d = -10$
$\Rightarrow k = ?$

9

6. $a_n = 4n - 7$
$\Rightarrow d = ?$

4

7. $a_3 = 7$
$a_8 = 37$
$\Rightarrow d = ?$

6

8. $a_{12} = 36$
$a_4 = 4$
$\Rightarrow a_6 = ?$

12

9. $a_6 = 66$
$a_9 = 99$
$\Rightarrow a_{20} = ?$

220

10. $a_6 + a_8 = 12$
$a_9 + a_6 = 24$
$\Rightarrow d = ?$

12

11. $a_8 - a_6 = 12$
$a_8 + a_{10} = 48$
$\Rightarrow a_{21} = ?$

96

12. $a_1 = -9$
$a_n = -67$
$d = -2$
$\Rightarrow n = ?$

30

13. $a_4 = 4$
$a_8 = 8$
$\Rightarrow a_n = ?$

n

14. $a_6 = 6x$
$a_{12} = 9x$
$d = 2$
$\Rightarrow x = ?$

4

15. $a_{12} = x$
$a_{20} = y$
$\Rightarrow a_{15} = ?$

$\frac{5x+3y}{8}$

16. $\frac{7a_{12}}{a_{18} + a_6} = ?$

$\frac{7}{2}$

17. $a_3 = 2$
$a_4 + a_6 + a_8 = 51$
$\Rightarrow d = ?$

5

18. $a_1 = 5$
$d = 3$
$\Rightarrow S_8 = ?$

124

19. $a_3 = 6$
$a_{10} = 27$
$\Rightarrow S_{10} = ?$

135

ÖZELLİK | Property 2

Geometrik Dizi | Geometrical Sequence

(a_n) bir dizi olmak üzere $\forall n \in N^+$ için;

(a_n) is a sequence and for $\forall n \in N^+$;

$$\frac{a_n}{a_{n-1}} = r$$

ise (a_n) dizisine geometrik dizi,
r'ye de ortak çarpan denir.
a_n geometrik dizi ise

(a_n) sequence is called geometric sequence
"r" is called common denominator.
if (a_n) geometric sequence

$$a_n = a_1 \cdot r^{n-1}$$

$$a_n = a_p \cdot r^{n-p}$$

$$a_n = \sqrt{a_{n-p} \cdot a_{n+p}}$$

$$S_n = a_1 \cdot \frac{1-r^n}{1-r}$$

Aşağıda verilen diziler geometrik dizidir.

The sequences below are the geometrical sequence.

1. $\frac{a_5 \cdot a_9}{a_3 \cdot a_8} = 8$

$\Rightarrow r = ?$

$\boxed{2}$

2. $r = \frac{1}{2}$

$a_4 = 6$

$a_k = 24$

$\Rightarrow k = ?$

$\boxed{2}$

3. $a_1 = 2$

$r = 6$

$\Rightarrow a_n = ?$

$\boxed{\frac{6^n}{3}}$

4. $a_1 = 4$

$r = \frac{1}{8}$

$\Rightarrow a_6 = ?$

$\boxed{2^{-13}}$

5. $a_3 = 1$

$a_7 = \frac{1}{81}$

$\Rightarrow r = ?$

$\boxed{\frac{1}{3}}$

6. $a_1 = 2$

$a_6 = 64$

$\Rightarrow a_9 = ?$

$\boxed{2^9}$

7. $a_1 = \frac{1}{2}$

$a_3 = 4$

$\Rightarrow r = ?$

$\boxed{2\sqrt{2}}$

8. $a_7 + a_4 = 2(a_7 - a_4)$

$\Rightarrow r = ?$

$\boxed{\sqrt[3]{3}}$

9. $a_5 - a_4 = 2$
$a_6 - a_3 = 7$
$\Rightarrow r = ?$

$\boxed{2}$

10. $a_4 = 3$
$a_8 = 3^{-3}$
$a_k = \frac{1}{81}$
$\Rightarrow k = ?$

$\boxed{9}$

11. $a_2 = 2$
$a_3 = 5$
$\Rightarrow a_6 = ?$

$\boxed{\frac{625}{8}}$

12. $a_2 = 2$
$a_3 = 32$
$\Rightarrow a_n = ?$

$\boxed{2^{4n-7}}$

13. $a_2 = 32$
$a_8 = 32$
$\Rightarrow r = ?$

$\boxed{1}$

14. $a_4 = a_2 + 36$
$a_2 + a_3 = 12$
$\Rightarrow a_1 + a_2 = ?$

$\boxed{3}$

15. $\frac{a_4}{a_7} = \frac{8}{125}$
$a_4 + a_6 = 29$
$\Rightarrow a_1 = ?$

$\boxed{\frac{32}{125}}$

16. $a_1 = 6$
$S_4 = 90$
$S_3 = 42$
$\Rightarrow r = ?$

$\boxed{2}$

17. $a_1 = 2$
$a_3 = 8$
$\Rightarrow S_{10} = ?$

$\boxed{2^{11} - 2}$

18. $S_n = 3 \cdot 2^{n+1}$
$\Rightarrow a_5 = ?$

$\boxed{96}$

ÖZELLİK | Property 3

Seri | Series

(a_n) bir dizi *(a sequence)*

$$\sum_{n=1}^{\infty} a_n = a_1 + a_2 + \ldots\ldots + a_n + \ldots\ldots$$

toplamına seri denir. *(the sum is called series.)*

Serinin sonucunu bulabilmek için;

(To find the result of the series;)

1) Kısmi toplamlar dizisi bulunur.

(1.series of partial sum is found.)

2) Bulunan dizinin limiti alınır.

(2. the limit of the defined series is taken)

- $S_n = \sum_{k=1}^{n} a_k$ Kısmi toplamlar dizisi *Series of partial sum*
- $\sum_{n=1}^{\infty} a_n = \lim_{n \to \infty} (S_n)$

Not | Note

Serinin sonucunun reel bir sayı olabilmesi için, dizinin limitinin kesinlikle 0 olması gerekir. Ancak dizinin limitinin 0 olması, serinin sonucunun reel bir sayı olmasını gerektirmez.

The result of the series to be a real number, the limit of the series should definetely be 0. However, if the limit of the series is 0 the result of the series doesn't require to be a real number.

(a_n) geometrik bir dizi *(one geometrical series)*

$$(a_n) = (a_1 \cdot r^{n-1})$$

$$\sum_{k=1}^{\infty} a_k = \frac{a_1}{1-r} \qquad |r| < 1$$

1. $\sum_{k=1}^{\infty} \frac{1}{(k+1)\cdot(k+2)} = ?$

$\frac{1}{2}$

2. $\sum_{k=3}^{\infty} \frac{1}{k\cdot(k+1)} = ?$

$\frac{1}{3}$

3. $\sum_{n=3}^{\infty} \frac{1}{n\cdot(n-2)} = ?$

$\frac{3}{4}$

4. $\sum_{n=1}^{\infty} \left(\frac{1}{4}\right)^{n+2} = ?$

$\frac{1}{48}$

5. $\sum_{k=0}^{\infty} 2^{1-k} = ?$

4

6. $1 + \frac{2}{5} + \frac{4}{25} + \ldots\ldots + \left(\frac{2}{5}\right)^n + \ldots\ldots = ?$

$\frac{5}{3}$

7. $\sum_{n=1}^{\infty} (-1)^n \cdot \left(\frac{2}{3}\right)^n = ?$

$-\frac{2}{5}$

8. $\sum_{k=0}^{\infty} \frac{1-2^k}{5^k} = ?$

$-\frac{5}{12}$

9. $\sum_{n=1}^{\infty} 2^{2+n} \cdot 3^{1-n} = ?$

24

10. $\prod_{k=1}^{\infty} 2^{\left(\frac{1}{2}\right)^k} = ?$

2

11. $\sum_{k=2}^{\infty} \frac{5^{k+1}}{2^{3k}} = ?$

$\frac{125}{24}$

12. $\sum_{n=1}^{\infty} \frac{4 \cdot 2^n - 5 \cdot 3^n}{5^n} = ?$

$-\frac{29}{6}$

13. $\sum_{n=0}^{\infty} \frac{3^n}{a^{n+1}} = \frac{1}{4} \quad \Rightarrow a = ?$

7

14. $\sum_{n=0}^{\infty} \frac{3^{2n} - 2^{3n}}{12^n} = ?$

1

15. $\sum_{k=1}^{\infty} (1,2)^{-k} = ?$

5

16. $\sum_{k=1}^{\infty} \frac{(-1)^{k-1}}{6^k} = ?$

$\frac{1}{7}$

17. $\sum_{n=1}^{\infty} (0,5)^{2n} = ?$

$\frac{1}{3}$

18. $\frac{15}{3^2} + \frac{15}{3^3} + \frac{15}{3^4} + \ldots\ldots + \frac{15}{3^n} + \ldots\ldots = ?$

$\frac{15}{6}$

19. $\sum_{n=1}^{\infty} \frac{a}{3^{n+2}} = \frac{11}{18} \quad \Rightarrow a = ?$

11

1. $(a_n) = (3n + 1)$
$\Rightarrow a_3 = ?$

A) 4 B) 7 C) 10 D) 13 E) 16

2. $(a_n) = (2n + 5)$
$\Rightarrow a_2 = ?$

A) 0 B) 5 C) 7 D) 9 E) 11

3. $(a_n) = (n - 1)!$
$\Rightarrow \frac{a_7}{a_5} = ?$

A) 24 B) 30 C) 42 D) 56 E) 72

4. $x \in Z$
$(a_n) = \begin{cases} n-1 & n = 2x+1 \\ 2n+3 & n = 2x \end{cases}$
$\Rightarrow a_5 + a_6 = ?$

A) 12 B) 17 C) 19 D) 21 E) 23

5. $(a_n) = \frac{n-3}{2n+k}$
$a_5 = \frac{1}{8}$
$\Rightarrow k = ?$

A) 6 B) 7 C) 8 D) 9 E) 10

6. $(a_n) = \left(\frac{2n-4}{n+3}\right)$
$a_k = \frac{36}{23}$
$\Rightarrow k = ?$

A) 20 B) 21 C) 22 D) 23 E) 24

7. $(a_n) = \left(\frac{n-2}{2n+4}\right)$
$a_k = \frac{5}{14}$
$\Rightarrow k = ?$

A) 10 B) 12 C) 16 D) 18 E) 20

8. $(a_n) = (n^2 - 8n + 10)$
$a_k = 19$
$\Rightarrow k = ?$

A) –1 B) 2 C) 4 D) 8 E) 9

9. $(a_n)=\left(\frac{2n-1}{15}\right)$

$(b_n)=\left(\frac{n+6}{27}\right)$

$a_k = b_k$

$\Rightarrow k = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

10. $(a_n)=\sum_{k=1}^{n}(k^2-2)$

$\Rightarrow a_5 = ?$

A) 85 B) 65 C) 45 D) 23 E) 22

11. $(a_n)=\prod_{k=1}^{n}3^k$

$\Rightarrow a_3 = ?$

A) 3^7 B) 3^6 C) 3^5 D) 3^4 E) 3^3

12. $(a_n)=\left(\frac{2+4+6+...+2n}{1+3+5+...+2n-1}\right)$

$\Rightarrow a_{11} = ?$

A) $\frac{1}{2}$ B) $\frac{11}{12}$ C) $\frac{30}{29}$ D) $\frac{12}{11}$ E) $\frac{9}{8}$

13. $(a_n)=\sum_{k=1}^{n}\frac{1}{k^2+k}$

$a_t=\frac{5}{6}$

$\Rightarrow t = ?$

A) 5 B) 6 C) 7 D) 8 E) 9

14. $n \in N^+$

$n > 1$

$a_n = a_{n-1} + 2n + 1$

$a_1 = 2$

$\Rightarrow a_5 = ?$

A) 22 B) 26 C) 30 D) 32 E) 34

15. $n \in N^+$

$n > 1$

$a_n = (n+1)\cdot a_{n-1}$

$a_1 = 1$

$\Rightarrow a_8 = ?$

A) $\frac{9!}{2}$ B) 8! C) 9! D) 11! E) 12!

16. $n \in N^+$

$n > 1$

$a_n = a_{n-1} + 4$

$a_1 = 2$

$\Rightarrow a_n = ?$

A) $4-3n$ B) $4n+2$ C) $4n$ D) $4n-3$ E) $4n-2$

1. $(a_n) = (n^2)$
$(b_n) = (n)$
$\Rightarrow \dfrac{a_n + b_n - 2}{b_n - 1} = ?$

A) $n + 1$ B) n^2 C) $n + 2$ D) n E) $n - 2$

2. $(a_n) = (a \cdot n + ab + a)$
$(b_n) = (3 \cdot n - 6)$
$(a_n) = (b_n)$
$\Rightarrow a + b = ?$

A) -1 B) 0 C) 2 D) 4 E) 5

3. $a_n = (a - 1) \cdot n^2 + 2b \cdot n - 4$
$b_n = 3 \cdot n^2 - a \cdot n + c$
$(a_n) = (b_n)$
$\Rightarrow a + b + c = ?$

A) -4 B) -2 C) 2 D) 4 E) 6

4. $(a_n) = \left(\dfrac{4n+6}{n+4}\right)$
$(b_n) = \left(\dfrac{2n+a}{bn+2}\right)$
$(a_n) = (b_n)$
$\Rightarrow \dfrac{a}{b} = ?$

A) 0 B) $\dfrac{1}{2}$ C) $\dfrac{3}{2}$ D) 3 E) 6

5. $(a_n) = \left(\dfrac{3n-2}{n+2}\right)$
$(b_n) = \left(3 + \dfrac{x}{n+2}\right)$
$(a_n) = (b_n)$
$\Rightarrow x = ?$

A) -8 B) -2 C) 0 D) 6 E) 8

6. $(a_n) = 3$
$\Rightarrow \prod_{k=1}^{5} (a_k) = ?$

A) 243 B) 162 C) 81 D) 27 E) 9

7. (a_n) sabit dizi *(constant sequences)*
$(a_n) = (a - b - 9) \cdot n^2 + (a + 2b) \cdot n - 2$
$\Rightarrow a = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

8. (a_n) sabit dizi *(constant sequences)*
$(a_n) = k \qquad k \in R$
$(a_n) = (a - 3) \cdot n^2 + (b + 2) \cdot n + a - b - 3$
$\Rightarrow k = ?$

A) -8 B) -6 C) -2 D) 1 E) 2

9. (a_n) sabit dizi *(constant sequences)*

$(a_n)=\left(\frac{4n+6}{3n-a}\right)$

$\Rightarrow a = ?$

A) -9 B) -6 C) $-\frac{9}{2}$ D) -2 E) -1

10. (a_n) sabit dizi *(constant sequences)*

$(a_n)=\left(\frac{(a-2)\cdot n+3}{(a+2)\cdot n+9}\right)$

$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

11. (a_n) sabit dizi *(constant sequences)*

$(a_n)=\left(\frac{a\cdot n-2}{4\cdot n+6}\right)$

$(a_n) = k \qquad k \in R$

$\Rightarrow k = ?$

A) $-\frac{1}{3}$ B) $-\frac{4}{3}$ C) -2 D) -4 E) -6

12. $\left.\begin{array}{l}(a_n)=\left(\frac{2n-2}{2n}\right)\\(b_n)=\left(\frac{3+n}{n}\right)\end{array}\right\}\Rightarrow (a_n)+(b_n)=?$

A) $\left(\frac{n}{3}\right)$ B) $\left(\frac{2}{n}\right)$ C) $\left(\frac{2n+2}{n}\right)$ D) $\left(\frac{3}{2n}\right)$ E) $\left(\frac{2n+1}{n}\right)$

13. $(a_n)=\left(\frac{n}{n-1}\right)$

$(b_n)=\left(\frac{2n}{n+1}\right)$

$\Rightarrow 2\cdot a_n - b_n = ?$

A) $\frac{5n^2+3}{n^2+n}$ B) $\frac{2n^2+1}{n^2-1}$ C) $\frac{4n}{n^2-1}$ D) $\frac{4n^2}{n-1}$ E) $\frac{4n}{1-n^2}$

14. $(a_n) = (3n + 2)$

$(b_n) = (n - 1)$

$\Rightarrow a_n \cdot b_n + 2 = ?$

A) $2n^2 + 2$ B) $2n^2 - n$ C) $3n^2 + n$ D) $3n^2 + n - 1$ E) $3n^2 - n$

15. $(a_n)=\left(\frac{3}{n}\right)$

$(b_n)=\left(\frac{n}{n+1}\right)$

$\Rightarrow a_n + \frac{1}{b_n} = ?$

A) $\frac{n-1}{n}$ B) $\frac{n^2+1}{n^2}$ C) $\frac{n+4}{n}$ D) $\frac{n+4}{n^2}$ E) $\frac{n+2}{n}$

16. $(a_n)=\left(\frac{(n-1)!}{3^n}\right)$

$(b_n)=\left(\frac{n!}{3^{n-1}}\right)$

$\Rightarrow \frac{a_n}{b_n} = ?$

A) $3\cdot(n+1)!$ B) $\frac{1}{3n}$ C) $3n$ D) $n+1$ E) $3\cdot(n+1)$

1. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_{12} = 36$

$a_8 = 8$

$\Rightarrow d = ?$

A) 4 B) 5 C) 6 D) 7 E) 8

2. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_{10} - a_5 = 30$

$\Rightarrow d = ?$

A) 5 B) 6 C) 10 D) 15 E) 30

3. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_3 = 10$

$d = 5$

$\Rightarrow a_8 = ?$

A) 50 B) 45 C) 40 D) 35 E) 30

4. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_5 = 24$

$d = 4$

$\Rightarrow a_1 = ?$

A) 4 B) 6 C) 8 D) 12 E) 16

5. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_{10} = 48$

$d = 4$

$\Rightarrow a_1 = ?$

A) 4 B) 8 C) 12 D) 16 E) 20

6. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_4 = 7$

$a_8 = 27$

$\Rightarrow d = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

7. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_2 = 5$

$a_{12} = 35$

$\Rightarrow a_{15} = ?$

A) 36 B) 38 C) 41 D) 44 E) 47

8. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_8 - a_5 = 15$

$a_9 = 32$

$\Rightarrow a_3 = ?$

A) 2 B) 3 C) 5 D) 6 E) 8

9. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_7 + a_{10} = 29$

$a_6 + a_{12} = 32$

$\Rightarrow a_8 - a_7 = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

10. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_3 = 10$

$a_9 = 34$

$\Rightarrow a_n = ?$

A) $n + 6$ B) $4n + 2$ C) $3n + 2$ D) $4n - 4$ E) $4n - 2$

11. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_4 + a_{20} = 60$

$\Rightarrow a_{12} = ?$

A) 20 B) 30 C) 40 D) 50 E) 60

12. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_1 + a_{15} = 20$

$\Rightarrow a_4 + a_{12} = ?$

A) 10 B) 15 C) 20 D) 25 E) 30

13. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_5 = 8$

$\Rightarrow a_1 + a_3 + a_7 + a_9 = ?$

A) 4 B) 8 C) 16 D) 24 E) 32

14. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_3 + a_4 + a_{10} + a_{11} = 20$

$\Rightarrow a_7 = ?$

A) 5 B) 8 C) 10 D) 12 E) 20

15. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_5 = 10$

$a_{18} = 49$

$\Rightarrow S_{20} = ?$

A) 530 B) 580 C) 600 D) 610 E) 622

16. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_3 = 11$

$a_7 = 19$

$\Rightarrow S_{16} = ?$

A) 302 B) 314 C) 326 D) 330 E) 352

1. (a_n) aritmetik dizi *(arithmetical sequence)*

$S_{30} = 1200$

$a_5 = 19$

$\Rightarrow d = ?$

A) 2 B) 3 C) 4 D) 6 E) 7

2. (a_n) aritmetik dizi *(arithmetical sequence)*

$S_{17} = 187$

$S_5 = 40$

$\Rightarrow a_1 = ?$

A) 11 B) 7 C) 3 D) 2 E) 0

3. (a_n) aritmetik dizi *(arithmetical sequence)*

$(a_n) = (4n + 1)$

$\Rightarrow S_{10} = ?$

A) 230 B) 240 C) 246 D) 250 E) 276

4. (a_n) aritmetik dizi *(arithmetical sequence)*

$(a_n) = 3n - 1$

$\Rightarrow S_{16} = ?$

A) 370 B) 372 C) 376 D) 380 E) 392

5. (a_n) aritmetik dizi *(arithmetical sequence)*

$S_n = 3n^2 + 3n$

$\Rightarrow d = ?$

A) 2 B) 3 C) 4 D) 6 E) 9

6. $S_n = 5n - 2$

$\Rightarrow a_6 = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

7. (a_n) aritmetik dizi *(arithmetical sequence)*

$S_n = n^2 + 6n$

$\Rightarrow a_n = ?$

A) $8n + 5$ B) $2n + 5$ C) $4n$ D) $2n + 3$ E) $4n + 1$

8. (a_n) aritmetik dizi *(arithmetical sequence)*

$S_n = n^2 - 3n$

$\Rightarrow a_n = ?$

A) $2n - 3$ B) $2n - 1$ C) $2n + 3$ D) $2n$ E) $2n - 4$

9. (a_n) aritmetik dizi *(arithmetical sequence)*

$S_{15} - S_{14} = 30$

$S_6 - S_5 = 12$

$\Rightarrow S_4 = ?$

A) 20 B) 25 C) 30 D) 35 E) 40

10. (a_n) aritmetik dizi *(arithmetical sequence)*

$S_{11} - S_8 = 114$

$S_4 - S_3 = 8$

$\Rightarrow d = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

11. (a_n) aritmetik dizi *(arithmetical sequence)*

$d = 6$

$S_9 = 261$

$\Rightarrow a_1 = ?$

A) 4 B) 5 C) 6 D) 7 E) 8

12. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_1 = -2$

$S_8 = 96$

$\Rightarrow d = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

13. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_1 = 5$

$d = 2$

$\Rightarrow S_6 = ?$

A) 52 B) 54 C) 56 D) 60 E) 64

14. $(a_n) = \left(\dfrac{2}{4n^2 - 1}\right)$

$\Rightarrow S_6 = ?$

A) $\frac{5}{6}$ B) $\frac{1}{3}$ C) $\frac{11}{12}$ D) $\frac{3}{4}$ E) $\frac{12}{13}$

15. $(a_n) = \sqrt{n+1} - \sqrt{n}$

$\Rightarrow S_{99} = ?$

A) 9 B) 10 C) 11 D) 12 E) 13

16. $S_n = \dfrac{3n^2 - 7n}{4}$

$\Rightarrow a_5 = ?$

A) 5 B) 10 C) 15 D) 20 E) 25

1. (a_n) geometrik dizi *(geometrical sequence)*

$(a_n) = 3^{n+1}$

$\Rightarrow a_{11} = ?$

A) 3^{11} B) 3^{12} C) 3^{13} D) 3^{14} E) 3^{15}

2. (a_n) geometrik dizi *(geometrical sequence)*

$a_1 = x$

$a_2 = x + 2$

$a_3 = x + 6$

$\Rightarrow x = ?$

A) 1 B) 2 C) 3 D) 4 E) 6

3. (a_n) geometrik dizi *(geometrical sequence)*

$x \in R^+$

$a_1 = 2$

$a_2 = x$

$a_3 = 2x + 6$

$\Rightarrow x = ?$

A) 2 B) 4 C) 6 D) 8 E) 16

4. (a_n) geometrik dizi *(geometrical sequence)*

$a_1 = 6$

$r = 2$

$\Rightarrow a_7 = ?$

A) 2^6 B) 2^7 C) $3 \cdot 2^6$ D) $3 \cdot 2^7$ E) 2^8

5. (a_n) geometrik dizi *(geometrical sequence)*

$a_4 = 81$

$r = 3$

$\Rightarrow a_2 = ?$

A) 3 B) 6 C) 9 D) 27 E) 81

6. (a_n) geometrik dizi *(geometrical sequence)*

$(a_n) \in R^+$

$a_1 = \frac{1}{12}$

$a_3 = 3$

$\Rightarrow r = ?$

A) 1 B) 2 C) 3 D) 6 E) 8

7. (a_n) geometrik dizi *(geometrical sequence)*

$a_1 = 128$

$r = \frac{1}{2}$

$\Rightarrow a_6 = ?$

A) 8 B) 4 C) 2 D) $\frac{1}{2}$ E) $\frac{1}{4}$

8. (a_n) geometrik dizi *(geometrical sequence)*

$a_4 = 8$

$r = \frac{1}{2}$

$\Rightarrow a_{12} = ?$

A) $\frac{1}{32}$ B) $\frac{1}{16}$ C) $\frac{1}{8}$ D) $\frac{1}{4}$ E) $\frac{1}{2}$

9. (a_n) geometrik dizi *(geometrical sequence)*

$(a_n) = \left(\frac{3}{2}, 1, \frac{2}{3}, \frac{4}{9}, \dots\right)$

$\Rightarrow a_9 = ?$

A) $\left(\frac{3}{2}\right)^{10}$ B) $\left(\frac{3}{2}\right)^{8}$ C) $\left(\frac{2}{3}\right)^{6}$ D) $\left(\frac{2}{3}\right)^{7}$ E) $\left(\frac{2}{3}\right)^{8}$

10. (a_n) geometrik dizi *(geometrical sequence)*

$(a_n) \in R^+$

$a_5 = 3$

$a_7 = 243$

$\Rightarrow r = ?$

A) $\sqrt[3]{3}$ B) $\sqrt{3}$ C) 3 D) $\sqrt[3]{9}$ E) 9

11. (a_n) geometrik dizi *(geometrical sequence)*

$(a_n) \in R^+$

$a_6 = \frac{1}{6}$

$a_{12} = 6$

$\Rightarrow a_9 = ?$

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 1 D) 2 E) 4

12. (a_n) geometrik dizi *(geometrical sequence)*

$k \in R^+$

$a_2 = k^4$

$a_{14} = k^8$

$r = 4$

$\Rightarrow k = ?$

A) $\frac{1}{16}$ B) $\frac{1}{4}$ C) 4 D) 8 E) 64

13. (a_n) geometrik dizi *(geometrical sequence)*

$a_4 = 1$

$a_9 = 243$

$\Rightarrow a_n = ?$

A) 3^n B) 3^{n-1} C) 3^{n-2} D) 3^{n-3} E) 3^{n-4}

14. (a_n) geometrik dizi *(geometrical sequence)*

$a_5 = 2$

$a_8 = 16$

$\Rightarrow a_n = ?$

A) 2^{n-3} B) 2^{n-1} C) 2^{n-4} D) 2^{3-n} E) 2^{n-2}

15. (a_n) geometrik dizi *(geometrical sequence)*

$a_1 = 4$

$a_2 = a$

$a_3 = b$

$a_4 = 32$

$\Rightarrow b = ?$

A) 6 B) 12 C) 16 D) 18 E) 24

16. (a_n) geometrik dizi *(geometrical sequence)*

$a_1 = 2$

$a_2 = x$

$a_3 = y$

$a_4 = 24$

$\Rightarrow x \cdot y = ?$

A) 48 B) 36 C) 24 D) $12\sqrt{2}$ E) 12

1. $\sum_{n=1}^{\infty}(3^n) = ?$

A) 3 B) 9 C) 243 D) 3^n E) ∞

2. $\sum_{n=1}^{\infty}\left(\frac{2}{5}\right)^{-n} = ?$

A) $\frac{1}{3}$ B) $\frac{5}{3}$ C) $\frac{25}{4}$ D) $\frac{25}{9}$ E) ∞

3. $\sum_{n=0}^{\infty}(3n) = ?$

A) ∞ B) 3n C) 3^n D) 9 E) 0

4. $\sum_{n=1}^{\infty}\left(\frac{1}{n+1} - \frac{1}{n+2}\right) = ?$

A) 2 B) $\frac{3}{2}$ C) 1 D) $\frac{1}{2}$ E) $\frac{1}{3}$

5. $\sum_{n=2}^{\infty}\left(\frac{2}{n} - \frac{2}{n+1}\right) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

6. $\sum_{n=2}^{\infty}\left(\frac{8}{n+2} - \frac{8}{n+3}\right) = ?$

A) 6 B) 5 C) $\frac{8}{3}$ D) 2 E) $\frac{7}{2}$

7. $\sum_{n=1}^{\infty}\left(\frac{1}{2n-1} - \frac{1}{2n+1}\right) = ?$

A) $\frac{2}{3}$ B) 1 C) 2 D) 3 E) 4

8. $\sum_{n=1}^{\infty}\left(\frac{1}{\sqrt{n+4}} - \frac{1}{\sqrt{n+3}}\right) = ?$

A) -1 B) $-\frac{1}{2}$ C) $-\frac{1}{3}$ D) 1 E) $\frac{1}{2}$

9. $\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\ldots\ldots=?$

A) $\sum_{n=1}^{\infty}\left(\frac{1}{2}\right)^n$ B) $\sum_{n=1}^{n}\left(\frac{1}{2}\right)$ C) $\sum_{n=-1}^{\infty}(2)^n$

D) $\sum_{n=1}^{\infty}\left(\frac{1}{4}\right)^n$ E) $\sum_{n=1}^{\infty}\left(\frac{1}{2}\right)^{n+1}$

10. $1+\frac{4}{3}+\frac{9}{5}+\frac{16}{7}+\ldots\ldots=?$

A) $\sum_{n=1}^{\infty}\frac{1}{2n-1}$ B) $\sum_{n=0}^{\infty}\frac{n+1}{2n-1}$ C) $\sum_{n=1}^{\infty}\frac{n}{2n+1}$

D) $\sum_{n=1}^{\infty}\frac{n}{2n-1}$ E) $\sum_{n=1}^{\infty}\frac{n^2}{2n-1}$

11. $(a_n)=\sum_{k=1}^{n}2$

$\Rightarrow S_n=?$

A) 2 B) 2n C) 2n + 2

D) $2n^2$ E) $n\cdot(n+1)$

12. $\sum_{k=0}^{n}\log\left(\frac{k+2}{k+1}\right)=?$

A) log(n – 1) B) logn C) log(n + 1)

D) $\log n^2$ E) log(n + 2)

13. $\frac{1}{3}+1+3+9+27+\ldots\ldots=?$

A) $\sum_{n=1}^{\infty}\left(\frac{4}{3}\right)^{n+1}$ B) $\sum_{n=0}^{\infty}3^{n-1}$ C) $\sum_{n=1}^{\infty}(-3)^{2n}$

D) $\sum_{n=1}^{\infty}\left(\frac{1}{2}\right)^n$ E) $\sum_{n=1}^{\infty}\left(-\frac{3}{2}\right)^n$

14. $0-1-2-3-4-\ldots\ldots=?$

A) $\sum_{n=1}^{\infty}n^2$ B) $\sum_{n=1}^{\infty}\sqrt{n}$ C) $\sum_{n=1}^{\infty}\left(-\frac{1}{2}\right)^{n-1}$

D) $\sum_{n=1}^{\infty}(1-n)$ E) $\sum_{n=1}^{\infty}\left(\frac{2}{3}\right)^{1-n}$

15. $\sum_{n=0}^{\infty}\left(\frac{1}{3}\right)^n=?$

A) $\frac{1}{3}$ B) 1 C) $\frac{3}{2}$ D) 2 E) $\frac{5}{2}$

16. $\sum_{n=0}^{\infty}\left(-\frac{3}{4}\right)^n=?$

A) 2 B) $\frac{4}{7}$ C) 1 D) $\frac{1}{3}$ E) $\frac{4}{3}$

1. $\sum_{n=0}^{\infty}\left(\frac{3}{2}\right)^{-n} = ?$

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) 3 E) 5

2. $\sum_{n=1}^{\infty}\left(\frac{1}{3}\right)^{n} = ?$

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) 1 D) $\frac{3}{2}$ E) 2

3. $\sum_{k=2}^{\infty}\frac{1}{3^k} = ?$

A) $\frac{1}{6}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{3}{2}$ E) 2

4. $\sum_{k=0}^{\infty}\frac{1}{2^{k+2}} = ?$

A) $\frac{1}{2}$ B) $\frac{3}{2}$ C) $\frac{5}{2}$ D) $\frac{4}{3}$ E) $\frac{7}{2}$

5. $\sum_{n=3}^{\infty}\left(\frac{1}{9}\right)^{n} = ?$

A) $\frac{1}{81}$ B) $\frac{2}{243}$ C) $\frac{8}{729}$ D) $\frac{2}{9}$ E) $\frac{1}{648}$

6. $\sum_{n=1}^{\infty}\frac{(-1)^n}{2^n} = ?$

A) $-\frac{1}{3}$ B) $\frac{1}{3}$ C) $\frac{1}{2}$ D) $\frac{2}{3}$ E) 2

7. $\sum_{n=1}^{\infty}(-1)^n\cdot\left(\frac{2}{7}\right)^{n} = ?$

A) $\frac{5}{2}$ B) $\frac{2}{7}$ C) $-\frac{2}{9}$ D) $-\frac{2}{5}$ E) $-\frac{2}{7}$

8. $\sum_{n=1}^{\infty}\left(\frac{4}{9}\right)^{n} = ?$

A) $\frac{9}{4}$ B) $\frac{9}{5}$ C) $\frac{81}{20}$ D) $\frac{4}{5}$ E) $\frac{4}{9}$

9. $\sum_{n=2}^{\infty}\left(\frac{1}{3}\right)^{n-2} = ?$

A) 2 B) $\frac{3}{2}$ C) 1 D) $\frac{2}{3}$ E) $\frac{1}{3}$

10. $x \geq 2$

$\sum_{n=0}^{\infty}\left(\frac{1}{x}\right)^{n} = 2$

$\Rightarrow x = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

11. $1 < x < 5$

$\sum_{n=0}^{\infty}\left(\frac{3}{x}\right)^{n} = 4$

$\Rightarrow x = ?$

A) 2 B) $\frac{5}{2}$ C) 3 D) $\frac{7}{2}$ E) 4

12. $\sum_{k=0}^{\infty}(2)^{-2n} = ?$

A) $\frac{1}{2}$ B) 1 C) $\frac{4}{3}$ D) $\frac{5}{3}$ E) 2

13. $\sum_{n=1}^{\infty}\left(\frac{2}{5}\right)^{n-3} = ?$

A) $\frac{5}{2}$ B) $\frac{25}{4}$ C) $\frac{25}{3}$ D) $\frac{125}{12}$ E) 125

14. $\sum_{n=0}^{\infty}\frac{2^n+5^n}{7^n} = ?$

A) $\frac{7}{10}$ B) 1 C) $\frac{7}{5}$ D) $\frac{14}{9}$ E) $\frac{49}{10}$

15. $\sum_{k=0}^{\infty}\frac{(-2)^k+3^k}{4^k} = ?$

A) $\frac{14}{3}$ B) $\frac{14}{5}$ C) 1 D) $\frac{1}{5}$ E) $\frac{1}{8}$

16. $1 \leq x < 6$

$\sum_{n=2}^{\infty}\frac{(-x)^{n-1}}{6^{n-1}} = -\frac{2}{5}$

$\Rightarrow x = ?$

A) 5 B) 4 C) 3 D) 2 E) 1

1. $(a_n) = (n^2 + 2^n)$
$\Rightarrow S_4 = ?$

A) 60 B) 62 C) 63 D) 64 E) 65

2. $(a_n) = (n^2 - 3n - 18)$
a_n dizisinin kaç terimi negatiftir?
a_n how many terms are negative?

A) 4 B) 5 C) 6 D) 7 E) 8

3. $(a_n) = \dfrac{6n+5}{2n-3}$
$a_k = 5$
$\Rightarrow k = ?$

A) 3 B) 4 C) 5 D) 6 E) 7

4. $(a_n) = \left(\dfrac{n-2}{3n+1}\right)$
$\Rightarrow a_{2n-1} = ?$

A) $\dfrac{2n-3}{6n-3}$ B) $\dfrac{n-3}{3n+1}$ C) $\dfrac{2n-3}{6n-2}$ D) $\dfrac{2n+2}{3n}$ E) $\dfrac{2n+2}{3n-1}$

5. $\lim\limits_{n\to\infty}\left(1+\dfrac{3}{n}\right)^{2n} = ?$

A) e^2 B) e^4 C) e^6 D) e^8 E) e^{10}

6. $\lim\limits_{n\to\infty}\left(\dfrac{3^n+2\cdot 5^n}{5^n+5\cdot 4^n}\right) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

7. (a_n) aritmetik dizi *(arithmetical sequence)*
$a_5 = 14$
$a_{11} = 38$
$\Rightarrow a_7 = ?$

A) 20 B) 22 C) 24 D) 26 E) 29

8. $(a_{n+1}) = (5n + 3)$
$\Rightarrow S_{20} = ?$

A) 900 B) 970 C) 1010 D) 1020 E) 1040

9. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_5 = 12$

$a_{11} + a_{16} = 75$

$\Rightarrow d = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

10. (a_n) aritmetik dizi *(arithmetical sequence)*

$a_5 + a_{11} = 48$

$\Rightarrow S_{15} = ?$

A) 300 B) 340 C) 360 D) 370 E) 385

11. $(a_n) \in R^+$

(a_n) geometrik dizi *(geometrical sequence)*

$a_6 - a_2 = 160$

$a_3 + a_5 = 60$

$\Rightarrow r = ?$

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) 2 D) 3 E) 5

12. $(a_n) \in R^+$

(a_n) geometrik dizi *(geometrical sequence)*

$a_5 - a_2 = 49$

$a_4 - a_2 = 21$

$\Rightarrow a_5 = ?$

A) 144 B) 120 C) 112 D) 96 E) 56

13. $\sum_{k=0}^{\infty}\left(\frac{8^k + 9^k}{10^k}\right) = ?$

A) 7 B) 11 C) 12 D) 13 E) 15

14. $\sum_{n=1}^{\infty}\frac{2^k}{3^k} = ?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) 2 D) 3 E) 4

15. $(a_n) \in R^+$

(a_n) geometrik dizi *(geometrical sequence)*

$a_1 = \sqrt{7} - \sqrt{3}$

$a_2 = x + 1$

$a_3 = \sqrt{7} + \sqrt{3}$

$\Rightarrow x = ?$

A) –1 B) 0 C) 1 D) 2 E) 3

16. $1 < n < m$

$\Rightarrow \sum_{k=0}^{\infty}\left(\frac{3n}{4m}\right)^k = ?$

A) $\frac{4m}{3n}$ B) $\frac{3n}{4m}$ C) $\frac{3m}{3n-5m}$ D) $\frac{4m}{4m-3n}$ E) $\frac{4m+3n}{4m}$

DİZİLER VE SERİLER

SEQUENCES AND SERIES

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	B	C	A	A	B	E	E	C	B	D	A	E	A	E

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	B	E	A	A	A	E	C	D	A	C	C	E	C	B

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	D	C	C	D	D	A	E	E	B	C	E	A	A	E

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	A	E	D	C	B	E	A	E	B	C	D	E	A	A

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	B	C	D	C	D	B	A	D	E	C	E	E	C	C	A

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	E	A	D	A	D	B	B	E	E	E	E	B	D	C	B

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	A	A	E	A	C	D	B	E	E	C	D	E	A	B

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	C	C	C	A	B	C	B	C	D	E	E	C	C	D

TÜREV

DERIVATIVE

TÜREV

TANIM | Definition

$$\lim_{x \to x_0^+} \frac{f(x) - f(x_0)}{x - x_0} = f'(x_0^+)$$

f fonksiyonunun x_0 noktasındaki sağdan türevi

right hand derivative on x_0 point of f function

$$\lim_{x \to x_0^-} \frac{f(x) - f(x_0)}{x - x_0} = f'(x_0^-)$$

f fonksiyonunun x_0 noktasındaki soldan türevi

left hand derivative on x_0 point of f function

$f'(x_0^+) = f'(x_0^-)$ ise f fonksiyonu x_0 noktasında türevlenebilir.

If $f'(x_0^+) = f'(x_0^-)$ derivative of f function can be taken on x_0 point.

$$\lim_{x \to x_0} \frac{f(x) - f(x_0)}{x - x_0} = f'(x_0)$$

f fonksiyonunun x_0 noktasındaki türevi

derivative on x_0 point of f function

Not | Note

$$f'(x) = \frac{df(x)}{dx} = \frac{dy}{dx}$$

ÖZELLİK | Property 1

$$f(x) = x^n \Rightarrow f'(x) = n \cdot x^{n-1}$$

1. $f(x) = x^3$

$\Rightarrow f'(x) = ?$

$3x^2$

2. $f(x) = x^7$

$\Rightarrow f'(x) = ?$

$7x^6$

3. $f(x) = \frac{1}{x}$

$\Rightarrow f'(x) = ?$

$-x^{-2}$

4. $f(x) = -\frac{1}{x^2}$

$\Rightarrow f'(x) = ?$

$\frac{2}{x^3}$

ÖZELLİK | Property 2

$$f(x) = \sqrt[n]{x^k} = x^{\left(\frac{k}{n}\right)}$$

$$f'(x) = \frac{k}{n} \cdot x^{\left(\frac{k}{n} - 1\right)}$$

1. $f(x) = \sqrt{x}$

$\Rightarrow f'(x) = ?$

$\frac{1}{2\sqrt{x}}$

2. $f(x) = \sqrt[3]{x}$

$\Rightarrow f'(x) = ?$

$\frac{1}{3 \cdot \sqrt[3]{x^2}}$

3. $f(x) = \sqrt[4]{x}$

$\Rightarrow f'(x) = ?$

$\frac{1}{4 \cdot \sqrt[4]{x^3}}$

4. $f(x) = -\sqrt{x}$

$\Rightarrow f'(4) = ?$

$-\frac{1}{4}$

5. $f(x) = \sqrt[5]{x}$

$\Rightarrow f'(-1) = ?$

$\frac{1}{5}$

6. $f(x) = \sqrt[3]{x} - \sqrt{x}$

$\Rightarrow f'(1) = ?$

$-\frac{1}{6}$

7. $f(x) = \sqrt[7]{x^4}$

$\Rightarrow f'(-1) = ?$

$-\frac{4}{7}$

ÖZELLİK | Property 3

- $[f(x) \pm g(x)]' = f'(x) \pm g'(x)$
- $k \in R$

  $[k \cdot f(x)]' = k \cdot f'(x)$
- $c \in R$

  $f(x) = c$

  $f'(x) = 0$

Not | Note

$a \in R$

$f'(a) = \left.\dfrac{df(x)}{dx}\right|_{x=a}$

1. $f(x) = 6x^2$

$\Rightarrow f'(x) = ?$

$12x$

2. $f(x) = x^3 - 2x^2$

$\Rightarrow f'(x) = ?$

$3x^2 - 4x$

3. $f(x) = 6x^3 - 2x + 1$

$\Rightarrow f'(x) = ?$

$18x^2 - 2$

4. $f(x) = 8$

$\Rightarrow f'(x) = ?$

0

5. $f(x) = 4x^2 - 2$

$\Rightarrow f'(x) = ?$

$8x$

6. $f(x) = 2x^{-4}$

$\Rightarrow f'(x) = ?$

$-8x^{-5}$

7. $f(x) = x^{-2} - 2x^{-1}$

$\Rightarrow f'(x) = ?$

$-2x^{-3} + 2x^{-2}$

8. $f(x) = 3x^2 - x^{-1}$

$\Rightarrow f'(x) = ?$

$6x + \dfrac{1}{x^2}$

9. $f(x) = 4x^3 - 2x + 1$

$\Rightarrow f'(1) = ?$

10

10. $f(x) = \dfrac{1}{x^2} - \dfrac{1}{x}$

$\Rightarrow f'(1) = ?$

-1

11. $a \in R$

$f(x) = x^3 - ax^2 + 1$

$f'(2) = 8$

$\Rightarrow a = ?$

1

12. $k \in R$

$f(x) = kx^2 + 3x + k + 2$

$f'(3) = 15$

$\Rightarrow k = ?$

2

13. $f(x) = x^3 + 2x$

$\Rightarrow \left.\dfrac{df(x)}{dx}\right|_{x=1} = ?$

5

14. $k \in R$

$f(x) = x^3 - 2x + kx$

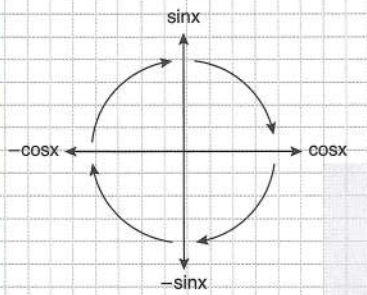
$f'(1) = 7$

$\Rightarrow k = ?$

6

ÖZELLİK | Property 4

- $f(x) = \sin x \Rightarrow f'(x) = \cos x$
- $f(x) = \cos x \Rightarrow f'(x) = -\sin x$



1. $f(x) = \sin x + 4$

$\Rightarrow f'(x) = ?$

$\cos x$

2. $f(x) = \cos x - \sin x$

$\Rightarrow f'(x) = ?$

$-\sin x - \cos x$

3. $f(x) = \sin x - \cos x$

$\Rightarrow f'(x) = ?$

$\cos x + \sin x$

4. $f(x) = 4 \cdot \cos x$

$\Rightarrow f'\left(\frac{\pi}{4}\right) = ?$

$-2\sqrt{2}$

5. $f(x) = -\sin x$

$\Rightarrow f'\left(\frac{\pi}{3}\right) = ?$

$-\frac{1}{2}$

6. $f(x) = \cos x - 2x$

$\Rightarrow f'\left(\frac{\pi}{6}\right) = ?$

$-\frac{5}{2}$

ÖZELLİK | Property 5

$a \in R$

- $f(x) = a^x \Rightarrow f'(x) = a^x \cdot \ln a$
- $f(x) = e^x \Rightarrow f'(x) = e^x \cdot \ln e = e^x$

1. $f(x) = 2^x$

$\Rightarrow f'(x) = ?$

$2^x \cdot \ln 2$

2. $f(x) = 5^x$

$\Rightarrow f'(x) = ?$

$5^x \cdot \ln 5$

3. $f(x) = x^3 + 3^x$

$\Rightarrow f'(x) = ?$

$3x^2 + 3^x \cdot \ln 3$

4. $f(x) = e^x + x^2$

$\Rightarrow f'(x) = ?$

$e^x + 2x$

5. $f(x) = e^x + 3x^2 + 7x$

$\Rightarrow f'(0) = ?$

8

6. $f(x) = 7^x$

$\Rightarrow f'(0) = ?$

$\ln 7$

7. $f(x) = 3^x$

$\Rightarrow f'(1) = ?$

$\ln 27$

ÖZELLİK | Property 6

İki Fonksiyonun Çarpımının Türevi

Derivative of Multiplication of Two Functions

$$[f(x) \cdot g(x)]' = f'(x) \cdot g(x) + g'(x) \cdot f(x)$$

1. $f(x) = (x^2 - 1) \cdot (x + 1)$

$\Rightarrow f'(x) = ?$

$3x^2 + 2x - 1$

2. $f(x) = (x^2 - x) \cdot (x + 1)$

$\Rightarrow f'(x) = ?$

$3x^2 - 1$

3. $f(x) = 2x^2 \cdot (x^2 - 1)$

$\Rightarrow f'(x) = ?$

$8x^3 - 4x$

4. $f(x) = (4x^2 - 1) \cdot (x^2 - 1)$

$\Rightarrow f'(1) = ?$

6

5. $f(x) = (x^3 + 1) \cdot (x - 1)$

$\Rightarrow f'(2) = ?$

21

6. $f(x) = \sin x \cdot (x^3 - 1)$

$\Rightarrow f'(x) = ?$

$\cos x \cdot (x^3 - 1) + \sin x \cdot (3x^2)$

7. $f(x) = (x - 1) \cdot (x - 2) \cdot (x - 3)$

$\Rightarrow f'(2) = ?$

-1

8. $f(x) = x \cdot \cos x$

$\Rightarrow f'(x) = ?$

$\cos x - x \cdot \sin x$

9. $f(x) = \sqrt{x} \cdot \sin x$

$\Rightarrow f'(x) = ?$

$\frac{1}{2\sqrt{x}} \cdot \sin x + \sqrt{x} \cdot \cos x$

10. $f(x) = x^3 \cdot 2^x$

$\Rightarrow f'(x) = ?$

$3x^2 \cdot 2^x + 2^x \cdot \ln 2 \cdot x^3$

11. $f(x) = x^2 \cdot \sin x$

$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

π

12. $f(x) = e^x \cdot \sin x$

$\Rightarrow f'(0) = ?$

1

ÖZELLİK | Property 7

İki Fonksiyonun Bölümünün Türevi

Derivative of Division of Two Functions

$$\left[\frac{f(x)}{g(x)}\right]' = \frac{f'(x)\cdot g(x) - g'(x)\cdot f(x)}{g^2(x)}$$

Not | Note

$$(\tan x)' = \left(\frac{\sin x}{\cos x}\right)' = \frac{\cos x\cdot\cos x + \sin x\cdot\sin x}{\cos^2 x}$$

$$= \boxed{\frac{1}{\cos^2 x} = \sec^2 x = 1 + \tan^2 x}$$

$$(\cot x)' = \left(\frac{\cos x}{\sin x}\right)' = \frac{-\sin x\cdot\sin x - \cos x\cdot\cos x}{\sin^2 x}$$

$$= \boxed{-\frac{1}{\sin^2 x} = -\operatorname{cosec}^2 x = -(1 + \cot^2 x)}$$

1. $f(x) = \dfrac{3x-1}{x+2}$

$\Rightarrow f'(x) = ?$

$\boxed{\dfrac{7}{(x+2)^2}}$

2. $f(x) = \dfrac{x+2}{x^2-1}$

$\Rightarrow f'(x) = ?$

$\boxed{\dfrac{-x^2-4x-1}{(x^2-1)^2}}$

3. $f(x) = \dfrac{x^3+2}{e^x}$

$\Rightarrow f'(0) = ?$

$\boxed{-2}$

4. $f(x) = \tan x$

$\Rightarrow f'(0) = ?$

$\boxed{1}$

5. $f(x) = \dfrac{\cos x}{3^x}$

$\Rightarrow f'(0) = ?$

$\boxed{-\ln 3}$

6. $f(x) = \dfrac{x^2+3x}{2x-1}$

$\Rightarrow f'(1) = ?$

$\boxed{-3}$

7. $f(x) = \dfrac{4x-7}{3x+2}$

$\Rightarrow f'(1) = ?$

$\boxed{\dfrac{29}{25}}$

8. $f(x) = \dfrac{h(x)}{g(x)}$

$h(2) = 2$

$h'(2) = 3$

$g(2) = 1$

$g'(2) = 4$

$\Rightarrow f'(2) = ?$

$\boxed{-5}$

ÖZELLİK | Property 8

Logaritma Fonksiyonunun Türevi

Derivative of Logarithmic Function

- $f(x) = \log_a x \quad \Rightarrow f'(x) = \dfrac{1}{x \cdot \ln a}$
- $f(x) = \ln x \quad \Rightarrow f'(x) = \dfrac{1}{x}$

1. $f(x) = \log_2 x$

$\Rightarrow f'(x) = ?$

$\boxed{\dfrac{1}{x \cdot \ln 2}}$

2. $f(x) = \log_7 x$

$\Rightarrow f'(x) = ?$

$\boxed{\dfrac{1}{x \cdot \ln 7}}$

3. $f(x) = \ln x$

$\Rightarrow f'(5) = ?$

$\boxed{\dfrac{1}{5}}$

4. $f(x) = x^2 + \ln x$

$\Rightarrow f'(x) = ?$

$\boxed{2x + \dfrac{1}{x}}$

5. $f(x) = \log_3 x$

$\Rightarrow f'(1) = ?$

$\boxed{\log_3 e}$

6. $f(x) = \log_3 7 + x^3$

$\Rightarrow f'(x) = ?$

$\boxed{3x^2}$

7. $f(x) = \dfrac{\ln x}{x}$

$\Rightarrow f'(1) = ?$

$\boxed{1}$

ÖZELLİK | Property 9

Ters Trigonometrik Fonksiyonunun Türevi

Derivative of Inverse Trigonometrical Function

- $f(x) = \arcsin x \quad \Rightarrow f'(x) = \dfrac{1}{\sqrt{1-x^2}}$
- $f(x) = \arccos x \quad \Rightarrow f'(x) = -\dfrac{1}{\sqrt{1-x^2}}$
- $f(x) = \arctan x \quad \Rightarrow f'(x) = \dfrac{1}{1+x^2}$
- $f(x) = \operatorname{arccot} x \quad \Rightarrow f'(x) = -\dfrac{1}{1+x^2}$

1. $f(x) = \operatorname{arccot} x$

$\Rightarrow f'(1) = ?$

$\boxed{-\dfrac{1}{2}}$

2. $f(x) = \arcsin x$

$\Rightarrow f'\left(\dfrac{1}{2}\right) = ?$

$\boxed{\dfrac{2}{\sqrt{3}}}$

3. $f(x) = \dfrac{\arctan x}{x^2}$

$\Rightarrow f'(1) = ?$

$\boxed{\dfrac{1-\pi}{2}}$

4. $f(x) = x \cdot \arccos x$

$\Rightarrow f'(0) = ?$

$\boxed{\dfrac{\pi}{2}}$

ÖZELLİK | Property 10

Bileşke Fonksiyonunun Türevi

Derivative of Composite Function

$$[f(g(x))]' = f'(g(x)) \cdot g'(x)$$

- $f(x) = [g(x)]^n \Rightarrow f'(x) = n \cdot [g(x)]^{n-1} \cdot g'(x)$
- $f(x) = a^{g(x)} \Rightarrow f'(x) = a^{g(x)} \cdot \ln a \cdot g'(x)$
- $f(x) = \sin(g(x)) \Rightarrow f'(x) = \cos(g(x)) \cdot g'(x)$
- $f(x) = \cos(g(x)) \Rightarrow f'(x) = -\sin(g(x)) \cdot g'(x)$
- $f(x) = \log_a g(x) \Rightarrow f'(x) = \dfrac{g'(x)}{g(x) \cdot \ln a}$
- $f(x) = \ln(g(x)) \Rightarrow f'(x) = \dfrac{g'(x)}{g(x)}$

1. $f(x) = (x^2 + x)^3$

$\Rightarrow f'(x) = ?$

$3(x^2 + x)^2 \cdot (2x + 1)$

2. $f(x) = (x^2 - x + 1)^5$

$\Rightarrow f'(x) = ?$

$5 \cdot (x^2 - x + 1)^4 \cdot (2x - 1)$

3. $f(x) = (x^2 - 2)^2 + 2x$

$\Rightarrow f'(2) = ?$

18

4. $f(x) = \sqrt{x + 2}$

$\Rightarrow f'(2) = ?$

$\dfrac{1}{4}$

5. $f(x) = \sqrt{x^2 + 7}$

$\Rightarrow f'(3) = ?$

$\dfrac{3}{4}$

6. $f(x) = \sin^2 x$

$\Rightarrow f'(x) = ?$

$\sin(2x)$

7. $f(x) = e^{2x}$

$\Rightarrow f'(x) = ?$

$2e^{2x}$

8. $f(x) = 3^{(x^3)}$

$\Rightarrow f'(x) = ?$

$3x^2 \cdot 3^{(x^3)} \cdot \ln 3$

9. $f(x) = e^{x^2 - 4}$

$\Rightarrow f'(2) = ?$

4

10. $f(x) = \ln(x + 3)$

$\Rightarrow f'(x) = ?$

$\dfrac{1}{x + 3}$

11. $f(x) = \ln(x^2 - 1)$

$\Rightarrow f'(x) = ?$

$\boxed{\dfrac{2x}{x^2 - 1}}$

12. $f(x) = \ln(x^3 + 4x)$

$\Rightarrow f'(2) = ?$

$\boxed{1}$

13. $f(x) = \ln(\sqrt{x})$

$\Rightarrow f'(4) = ?$

$\boxed{\dfrac{1}{8}}$

14. $f(x) = e^{x^2 + 4x}$

$\Rightarrow f'(0) = ?$

$\boxed{4}$

15. $f(x) = e^{\cos x}$

$\Rightarrow f'(x) = ?$

$\boxed{-\sin x \cdot e^{\cos x}}$

16. $f(x) = e^{\tan x}$

$\Rightarrow f'\left(\dfrac{3\pi}{4}\right) = ?$

$\boxed{\dfrac{2}{e}}$

17. $f(x) = \arccos(x^2)$

$\Rightarrow f'(x) = ?$

$\boxed{\dfrac{-2x}{\sqrt{1 - x^4}}}$

18. $f(x) = \arctan(x^2 + 1)$

$\Rightarrow f'(1) = ?$

$\boxed{\dfrac{2}{5}}$

19. $f(x) = \arctan(x^3)$

$\Rightarrow f'(1) = ?$

$\boxed{\dfrac{3}{2}}$

20. $f(x) = \operatorname{arccot}^2 x$

$\Rightarrow f'(1) = ?$

$\boxed{-\dfrac{\pi}{4}}$

21. $f(x) = \cos^3(2x)$

$\Rightarrow f'(x) = ?$

$\boxed{-6 \cdot \cos^2(2x) \cdot \sin(2x)}$

22. $f(x) = \ln^3(x^2)$

$\Rightarrow f'(x) = ?$

$\boxed{\dfrac{6}{x} \cdot \ln^2(x^2)}$

23. $f(x) = \arcsin^2(x^2)$

$\Rightarrow f'(x) = ?$

$\boxed{4 \cdot \arcsin(x^2) \cdot \dfrac{x}{\sqrt{1 - x^4}}}$

24. $f(x) = \ln^2(x^2 + 1)$

$\Rightarrow f'(1) = ?$

$\boxed{\ln 4}$

ÖZELLİK | Property 11

$$[f(g(x))]' = f'(g(x)) \cdot g'(x)$$

1. $f(x) = 2x + 4$

$g(x) = x^2 + 1$

$\Rightarrow (fog)'(x) = ?$

$\boxed{4x}$

2. $f(x) = 2x^2 - 1$

$g(x) = x^2$

$\Rightarrow (fog)'(x) = ?$

$\boxed{8x^3}$

3. $f(x) = x^2 + 1$

$g(x) = x^3$

$\Rightarrow (gof)'(1) = ?$

$\boxed{24}$

4. $f(x) = x^3 - 1$

$g(x) = x^2$

$\Rightarrow (fog)'(2) = ?$

$\boxed{192}$

5. $f(x) = 3x + 1$

$g(x) = 2x^2 + 4$

$\Rightarrow (gof)'(1) = ?$

$\boxed{48}$

6. $f(x) = 4x^2 - x$

$g(x) = x^2$

$\Rightarrow (gof)'(-1) = ?$

$\boxed{-90}$

7. $f(x) = 5x^2 + x$

$g(x) = 3x^2$

$\Rightarrow (fog)'(1) = ?$

$\boxed{186}$

8. $f(x) = x^3$

$g(x) = x^2 - 1$

$\Rightarrow (fog)'(1) = ?$

$\boxed{0}$

9. $f(x) = x^3 - 3x^2 + 5x + 7$

$g(x) = 4x^2 - 5x + 1$

$\Rightarrow (fog)'(0) = ?$

$\boxed{-10}$

10. $f(4x - 1) = 3x^2 - 5x + 1$

$\Rightarrow f'(3) = ?$

$\boxed{\frac{1}{4}}$

11. $f(2x - 1) = \dfrac{x^2 - 7x}{2x + 1}$

$\Rightarrow f'(5) = ?$

$\boxed{\frac{17}{98}}$

ÖZELLİK | Property 12

Zincir Kuralı | Chain Rule

$y = f(u)$

$u = h(t)$

$t = g(x)$

$$\boxed{\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dt} \cdot \frac{dt}{dx}}$$

1. $y = k + 3$

$k = 3t + 5$

$\Rightarrow \frac{dy}{dt} = ?$

3

2. $y = 5t^2 - 8$

$t = 2m - 1$

$\Rightarrow \left.\frac{dy}{dm}\right|_{m=2} = ?$

60

3. $y = 2x - 5$

$x = t^2 - 3$

$\Rightarrow \left.\frac{dy}{dt}\right|_{t=3} = ?$

12

4. $y = 2x^2 - 4$

$x = t^3 - 1$

$\Rightarrow \left.\frac{dy}{dt}\right|_{t=2} = ?$

336

5. $y = x^2$

$x = 4t + 1$

$t = 3m - 2$

$\Rightarrow \left.\frac{dy}{dm}\right|_{m=1} = ?$

120

6. $x = 4y^2$

$y = 3t$

$t = k^2 - 1$

$\Rightarrow \left.\frac{dx}{dk}\right|_{k=2} = ?$

864

7. $x = 4t$

$t = y^2 + 2y$

$y = 3m - 1$

$\Rightarrow \left.\frac{dx}{dm}\right|_{m=1} = ?$

72

ÖZELLİK | Property 13

Parametrik Fonksiyonunun Türevi
Derivative of Parametric Function

$y = f(t)$

$x = h(t)$

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$$

1. $y = 2t^2 - 2$

$x = 3t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=2} = ?$

$\frac{8}{3}$

2. $y = 2m^2 - 3m$

$x = 3m^2$

$\Rightarrow \left.\frac{dy}{dx}\right|_{m=1} = ?$

$\frac{1}{6}$

3. $y = \cos t$

$x = \sin t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=\frac{\pi}{4}} = ?$

-1

4. $y = 3^t$

$x = \sin t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=0} = ?$

$\ln 3$

5. $y = \ln t^2$

$x = t^3$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=2} = ?$

$\frac{1}{12}$

6. $y = t^2 - 1$

$x = \arctan t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=2} = ?$

20

7. $y = t^3 - 1$

$x = \sqrt{t}$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=4} = ?$

192

ÖZELLİK | Property 14

Kapalı Fonksiyonunun Türevi

Derivative of Closed Function

$F(x, y) = 0 \qquad (y = f(x))$

$$\boxed{\frac{dy}{dx} = -\frac{F_x}{F_y}}$$

F_x : Fonksiyonun x'e göre türevidir. x'e göre türev alınırken y sabit gibi düşünülür.

Derivative with respect to x. When taking derivative with respect to x, y is thought to be constant.

F_y : Fonksiyonun y'ye göre türevidir. y'ye göre türev alınırken x sabit gibi düşünülür.

Derivative with respect to y. When taking derivative with respect to y, x is thought to be constant.

1. $6x^2 - 12y^2 - 3x + 9 = 0$

$\Rightarrow \left.\frac{dy}{dx}\right|_{(1,\,1)} = ?$

$\boxed{\frac{3}{8}}$

2. $5x + y^2 + 4 = 0$

$\Rightarrow \left.\frac{dy}{dx}\right|_{(-1,\,1)} = ?$

$\boxed{-\frac{5}{2}}$

3. $4xy - x^2 - 4 = 0$

$\Rightarrow \left.\frac{dy}{dx}\right|_{(2,\,1)} = ?$

$\boxed{0}$

4. $2x^3y + 3x^2y^3 = 28$

$\Rightarrow \left.\frac{dy}{dx}\right|_{(1,\,2)} = ?$

$\boxed{-\frac{30}{19}}$

5. $2x^3 - 8y^3 = 24$

$\Rightarrow \left.\frac{dy}{dx}\right|_{x=2} = ?$

$\boxed{1}$

6. $4x - 12y^3 = 24$

$\Rightarrow \left.\frac{dy}{dx}\right|_{x=3} = ?$

$\boxed{\frac{1}{9}}$

7. $6x^2 - 12y^2 - 3x - 6 = 0$

$\Rightarrow \left.\frac{dy}{dx}\right|_{(2,\,1)} = ?$

$\boxed{\frac{7}{8}}$

ÖZELLİK | Property 15

Ters Fonksiyonunun Türevi

Derivative of Inverse Function

$f: R \to R$

$f(x_0) = y_0$

$$(f^{-1})'(y_0) = \frac{1}{f'(x_0)}$$

1. $f(x) = \log_2(4x + 6)$

$\Rightarrow (f^{-1})'(3) = ?$

$\ln 4$

2. $f(6x + 4) = x^3 + 4x$

$\Rightarrow (f^{-1})'(5) = ?$

$\frac{6}{7}$

3. $f: R^- \to R$

$f(x) = x^2 + 5x - 18$

$\Rightarrow (f^{-1})'(-4) = ?$

$-\frac{1}{9}$

4. $f(x) = \frac{3^x - 1}{3^x + 1}$

$\Rightarrow (f^{-1})'\left(\frac{1}{2}\right) = ?$

$\frac{8}{3 \cdot \ln 3}$

5. $f(x) = 3^{x-2}$

$\Rightarrow (f^{-1})'(9) = ?$

$\frac{1}{9 \cdot \ln 3}$

6. $f: R^+ \to R^+$

$f(x) = \sqrt{x + 2} + 1$

$\Rightarrow (f^{-1})'(4) = ?$

6

7. $f: R \to R$

$f(2) = 10$

$f'(2) = 5$

$\Rightarrow (f^{-1})'(10) = ?$

$\frac{1}{5}$

8. $f: [2, \infty) \to [-1, \infty)$

$f(x) = x^2 - x - 3$

$\Rightarrow (f^{-1})'(-1) = ?$

$\frac{1}{3}$

9. $f: R \setminus \{2\} \to R$

$f(x) = \frac{x^4 - 16}{x - 2}$

$\Rightarrow (f^{-1})'(8) = ?$

$\frac{1}{4}$

ÖZELLİK | Property 16

Yüksek Mertebeden Türev

High Order Derivative

$$y = f(x)$$

$$\frac{dy}{dx} = \frac{df(x)}{dx} = f'(x)$$ 1. Türev *(first derivative)*

$$\frac{d^2y}{dx^2} = \frac{d^2f(x)}{dx^2} = f''(x)$$ 2. Türev *(second derivative)*

$$\frac{d^ny}{dx^n} = \frac{d^nf(x)}{dx^n} = f^{(n)}(x)$$ n. Türev *(n^{th} derivative)*

1. $f(x) = x^7$

$$\Rightarrow \frac{d^7f(x)}{dx^7} = ?$$

$\boxed{7!}$

2. $f(x) = e^x$

$$\Rightarrow \frac{d^{30}f(x)}{dx^{30}} = ?$$

$\boxed{e^x}$

3. $f(x) = e^{2x}$

$$\Rightarrow \frac{d^{10}f(x)}{dx^{10}} = ?$$

$\boxed{2^{10} \cdot e^{2x}}$

4. $f(x) = \frac{1}{x}$

$$\Rightarrow \frac{d^{20}f(x)}{dx^{20}} = ?$$

$\boxed{\frac{20!}{x^{21}}}$

5. $f(x) = \ln x$

$$\Rightarrow \frac{d^{14}f(x)}{dx^{14}} = ?$$

$\boxed{-13! \cdot x^{-14}}$

6. $f(x) = \ln(x)^{10}$

$$\Rightarrow \frac{d^{10}f(x)}{dx^{10}} = ?$$

$\boxed{-10! \cdot x^{-10}}$

7. $f(x) = \ln(x + 3)$

$$\Rightarrow \frac{d^8f(x)}{dx^8} = ?$$

$\boxed{-\frac{7!}{(x+3)^8}}$

ÖZELLİK | Property 17

Logaritmik Türev
Logarithmic Derivative

$$f(x) = g(x)^{h(x)}$$

$$\ln(f(x)) = \ln(g(x))^{h(x)}$$

$$\ln(f(x)) = h(x) \cdot \ln(g(x))$$

$$\frac{f'(x)}{f(x)} = h'(x) \cdot \ln(g(x)) + \frac{g'(x)}{g(x)} \cdot h(x)$$

$$f'(x) = f(x) \cdot \left[h'(x) \cdot \ln(g(x)) + \frac{g'(x)}{g(x)} \cdot h(x)\right]$$

1. $f(x) = x^x$

$\Rightarrow f'(x) = ?$

$x^x \cdot (\ln x + 1)$

2. $f(x) = x^{4x}$

$\Rightarrow f'(e) = ?$

$8e^{4e}$

3. $f(x) = x^{(x+1)}$

$\Rightarrow f'(1) = ?$

2

4. $f(x) = (4x - 2)^x$

$\Rightarrow f'(1) = ?$

$\ln 4 + 4$

5. $f(x) = (3x - 5)^{2x}$

$\Rightarrow f'(2) = ?$

12

6. $f(x) = x^{\sin x}$

$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

1

7. $f(x) = x^{\cos x}$

$\Rightarrow f'(1) = ?$

$\cos 1$

ÖZELLİK | Property 18

Parçalı Fonksiyonun Türevi

Derivative of Piecewise Function

Özel tanımlı fonksiyonların türevi belirli noktalarda alınabilir. Fonksiyonun kritik noktalarında türevi istenirse fonksiyonun sürekliliği ve sağ/sol türevleri incelenir.

- Fonksiyon sürekli ve sağ türevi ile sol türevi eşit ise fonksiyon türevlenebilir. Fonksiyonun türevi, fonksiyonun o noktadaki sağ/sol türevine eşittir.
- Fonksiyon bir noktada süreksiz ise o noktada türev yoktur.
- Fonksiyon sürekli fakat sağ türev ile sol türev farklı ise o noktada türev yoktur.

Derivative of customed defined function can be taken in some specific points. If derivative of function on critical points is needed the continuity of function and left/right derivatives are analysed.

- *If function is continuous and right-hand derivative and left-hand derivatives are equal than function is differentiable. the derivative of function is equal to its left-hand and right-hand derivative.*
- *If functions is non-continuous on a point then there is no derivative.*
- *If function is continuous but right-hand derivative is different from left-hand derivative then there is no derivative on that point.*

$$f(x) = \begin{cases} h(x) & x \geq a \\ g(x) & x < a \end{cases}$$

a kritik nokta *(a is critical point)*

1. $f(x) = \begin{cases} 2x^2 + 6 & x < 2 \\ 8x - 2 & x \geq 2 \end{cases}$

$\Rightarrow f'(2) = ?$

8

2. $f(x) = \begin{cases} x^2 + x & x \leq 4 \\ 9x - 16 & x > 4 \end{cases}$

$\Rightarrow f'(5) + f'(4) = ?$

18

3. f fonksiyonu, 1 noktasında türevlenebilir.
Derivative of function f can be taken on point 1.

$f(x) = \begin{cases} 4x + 2 & x > 1 \\ 2x^2 + k & x \leq 1 \end{cases}$

$\Rightarrow k + f'(1) = ?$

8

4. f fonksiyonu, 2 noktasında türevlenebilir.
Derivative of function f can be taken on point 2.

$f(x) = \begin{cases} 3x^2 + 2 & x < 2 \\ a & x = 2 \\ 12x + m & x > 2 \end{cases}$

$\Rightarrow m + a + f'(2) = ?$

16

5. f fonksiyonu, 4 noktasında türevlenebilir.
Derivative of function f can be taken on point 4.

$f(x) = \begin{cases} 6x^2 + k & x < 4 \\ t & x = 4 \\ x^3 & x > 4 \end{cases}$

$\Rightarrow f'(4) + k + t = ?$

80

6. f fonksiyonu, 2 noktasında türevlenebilir.
Derivative of function f can be taken on point 2.

$f(x) = \begin{cases} 3x^2 - k & x > 2 \\ m & x = 2 \\ 12x & x < 2 \end{cases}$

$\Rightarrow f'(2) + m + k = ?$

24

7. f fonksiyonu, 1 noktasında türevlenebilir.
Derivative of function f can be taken on point 1.

$f(x) = \begin{cases} 2x^3 - k & x > 1 \\ m & x = 1 \\ 6x + 4 & x < 1 \end{cases}$

$\Rightarrow 2f'(1) - m + \frac{k}{2} = ?$

-2

ÖZELLİK | Property 19

Mutlak Değer Fonksiyonunun Türevi
Derivative of Absolute Value Function

$$f(x) = |g(x)|$$

$$g(a) = 0 \qquad a \in R$$

"a" noktası, f fonksiyonunun kritik noktasıdır.
"a" point is the critical point of the function.

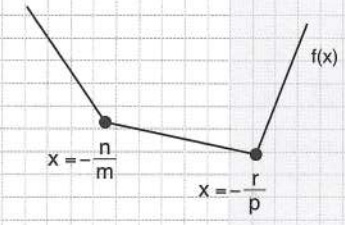
- $f(x) = |mx + n| + |px + r|$

f fonksiyonu, bütün reel sayılarda süreklidir. Fakat kırılma noktalarında sağ ve sol türevler farklı olduğundan, kırılma noktalarında türev yoktur.

Kırılma noktaları; $-\frac{n}{m}$ ve $-\frac{r}{p}$ dir.

f function is continuous in all real numbers. However, as right-hand and left-hand derivatives are different there is no derivative on their breaking points.

Breaking points are; $-\frac{n}{m}$ *and* $-\frac{r}{p}$ *dir.*



1. $f(x) = |x - 3|$

$\Rightarrow f'(2) = ?$

$\boxed{-1}$

2. $f(x) = |3x - 20|$

$\Rightarrow f'(7) = ?$

$\boxed{3}$

3. $f(x) = |x^2 - 4x|$

$\Rightarrow f'(2) = ?$

$\boxed{0}$

4. $f(x) = |x - 2|$

$\Rightarrow f'(2) = ?$

$\boxed{\varnothing}$

5. $f(x) = |\cos x - 4|$

$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

$\boxed{1}$

6. $f(x) = |x^2 - 3x - 4|$

$\Rightarrow f'(2) = ?$

$\boxed{-1}$

7. $f(x) = x^2 \cdot |x|$

$\Rightarrow f'(0) = ?$

$\boxed{0}$

8. $f(x) = x^2 \cdot |3x + 15|$

$\Rightarrow f'(2) = ?$

$\boxed{96}$

9. $f(x) = x^3 \cdot |2x - 8|$

$\Rightarrow f'(1) = ?$

$\boxed{16}$

10. $f(x) = |x^2 - 4x + 4|$

$\Rightarrow f'(2) = ?$

$\boxed{0}$

ÖZELLİK | Property 20

İşaret Fonksiyonunun Türevi

Derivative of Indicator Function

$$f(x) = \text{sgn}(g(x))$$

$$g(a) = 0 \qquad a \in R$$

"a" noktası, f fonksiyonunun kritik noktasıdır. İşaret fonksiyonu sabit değer aldığından, sürekli olduğu noktalarda türevi sıfırdır. Süreksiz olduğu noktalarda türevi yoktur.

"a" point is the critical point of f function. As indicator function takes constant value its derivative is zero on the points where it is continuous. There is no derivative on the non-continuous points.

1. $f(x) = x^2 \cdot \text{sgn}(x-3)$

$\Rightarrow f'(4) = ?$

8

2. $f(x) = x^2 + x \cdot \text{sgn}(x+2)$

$\Rightarrow f'(3) = ?$

7

3. $f(x) = \text{sgn}(x-3) + x^2$

$\Rightarrow f'(3) = ?$

Ø

4. $f(x) = |x-1| + \text{sgn}(x-3) \cdot x$

$\Rightarrow f'(2) = ?$

0

5. $f(x) = x \cdot |x-2| + \text{sgn}(|x-2|)$

$\Rightarrow f'(1) = ?$

0

6. $f(x) = |x^2 - 4x| + [\text{sgn}(x-2)] \cdot x$

$\Rightarrow f'(3) = ?$

-1

7. $f(x) = \begin{cases} |x^2 - 2x| & x > 3 \\ x^2 \cdot \text{sgn}(x-2) & x \le 3 \end{cases}$

$\Rightarrow f'(2) = ?$

Ø

8. $f(x) = \text{sgn}(x^2 - 5x + 4) \cdot x + |x-2|$

$\Rightarrow f'(-3) = ?$

0

9. $f(x) = \text{sgn}(x^2 - 9) \cdot x^3 + x$

$\Rightarrow f'(2) = ?$

-11

10. $f(x) = |x-3| + \text{sgn}(x-5) \cdot \sqrt{x^2 - 1} + x$

$\Rightarrow f'(2) = ?$

$-\frac{2}{\sqrt{3}}$

ÖZELLİK | Property 21

Tam Değer Fonksiyonun Türevi
Derivative of Greatest Integer Function

$$f(x) = [\![g(x)]\!]$$

$$g(a) \in Z \qquad a \in R$$

"a" noktası, f fonksiyonunun kritik noktasıdır. Tam değer fonksiyonu sabit değer aldığından, sürekli olduğu noktalarda türevi sıfırdır. Süreksiz olduğu noktalarda türevi yoktur.

"a" point is the critical point of f function. As greatest integer function takes constant value its derivative is zero on the points where it is continuous. There is no derivative on the non-continuous points.

1. $f(x) = [\![x]\!]$

$\Rightarrow f'(4) = ?$

Ø

2. $f(x) = [\![x]\!]$

$\Rightarrow f'\left(\frac{3}{2}\right) = ?$

0

3. $f(x) = [\![x-2]\!]$

$\Rightarrow f'\left(\frac{1}{2}\right) = ?$

0

4. $f(x) = (x^2+1)\cdot[\![x+3]\!]$

$\Rightarrow f'\left(\frac{3}{2}\right) = ?$

12

5. $f(x) = x^3 \cdot \left[\!\left[\frac{x}{3}+2\right]\!\right]$

$\Rightarrow f'(2) = ?$

24

6. $f(x) = \left[\!\left[\frac{x+5}{2}\right]\!\right] \cdot \operatorname{sgn}(x-3)$

$\Rightarrow f'(4) = ?$

0

7. $f(x) = 3\cdot[\![x^2-1]\!]\cdot(x^2+1)$

$\Rightarrow f'\left(\frac{3}{2}\right) = ?$

9

8. $f(x) = \left[\!\left[\frac{x-2}{7}\right]\!\right] \cdot x^5$

$\Rightarrow f'(9) = ?$

Ø

9. $f(x) = 3\cdot[\![(x-1)^2]\!]$

$\Rightarrow f'(1) = ?$

0

10. $f(x) = (x^2-16)\cdot\left[\!\left[\frac{x}{4}-1\right]\!\right]$

$\Rightarrow f'(2) = ?$

-4

11. $f(x) = |x^2-4| + \operatorname{sgn}(x-3) + \left[\!\left[x+\frac{3}{2}\right]\!\right]$

$\Rightarrow f'(4) = ?$

8

ÖZELLİK | Property 22

$$\lim_{x \to x_0} \frac{f(x) - f(x_0)}{x - x_0} = f'(x_0)$$

f fonksiyonunun x_0 noktasındaki türevi

derivative on x_0 point of f function

$$\lim_{h \to 0} \frac{f(x_0 + h) - f(x_0)}{h} = f'(x_0)$$

f fonksiyonunun x_0 noktasındaki türevi

derivative on x_0 point of f function

1. $f(x) = 2x + 1$

$\Rightarrow \lim_{x \to 2} \frac{f(x) - f(2)}{x - 2} = ?$ **2**

2. $f(x) = 3x^2 - 2$

$\Rightarrow \lim_{x \to 1} \frac{f(x) - f(1)}{x - 1} = ?$ **6**

3. $f(x) = 4x^3 - 2$

$\Rightarrow \lim_{x \to 3} \frac{f(x) - f(3)}{x - 3} = ?$ **108**

4. $f(x) = 4x^2 - 2x$

$\Rightarrow \lim_{h \to 0} \frac{f(h + 1) - f(1)}{h} = ?$ **6**

5. $f(x) = 4x^2 + 2x - 1$

$\Rightarrow \lim_{h \to 0} \frac{f(h + 2) - f(2)}{h} = ?$ **18**

6. $f(x) = 4x^2 + 1$

$\Rightarrow \lim_{x \to 3} \frac{f(x) - f(3)}{x - 3} = ?$ **24**

7. $f(x) = x^3 - 4x^2 + 5$

$\Rightarrow \lim_{x \to 2} \frac{f(x) - f(2)}{x - 2} = ?$ **– 4**

8. $f(x) = 3x^2 - 6x + 4$

$\Rightarrow \lim_{x \to -1} \frac{f(x) - f(-1)}{x + 1} = ?$ **– 12**

9. $f(x) = 4x^3 - 2x$

$\Rightarrow \lim_{h \to 0} \frac{f(h + 2) - f(2)}{h} = ?$ **46**

10. $f(x) = 3x^2 - 4x - 8$

$\Rightarrow \lim_{h \to 0} \frac{f(h + 1) - f(1)}{h} = ?$ **2**

11. $f(x) = 6x^2 + 3ax$

$\lim_{x \to -2} \frac{f(x) - f(-2)}{x + 2} = -21$ **1**

$\Rightarrow a = ?$

12. $f(x) = 3x^2 - ax$

$\lim_{x \to 4} \frac{f(x) - f(4)}{x - 4} = 22$ **2**

$\Rightarrow a = ?$

ÖZELLİK | Property 23

L'Hospital Kuralı

Rule of L'Hospital

$$\lim_{x \to a} \frac{f(x)}{g(x)} = \frac{0}{0} \quad \text{veya}$$

$$\lim_{x \to a} \frac{f(x)}{g(x)} = \frac{\infty}{\infty}$$

$$\Rightarrow \boxed{\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)}}$$

1. $f(x) = \sqrt{12x+1}$

$$\Rightarrow \lim_{h \to 0} \frac{f(h+4) - f(4)}{h} = ?$$

$\boxed{\frac{6}{7}}$

2. $f'(2) = 4\sqrt{2}$

$$\Rightarrow \lim_{h \to 0} \frac{f(2+h) - f(2-3h)}{8h} = ?$$

$\boxed{2\sqrt{2}}$

3. $f(x) = x^3 - 6x^2 + 14$

$$\Rightarrow \lim_{h \to 0} \frac{f(h+3) - f(3)}{h} = ?$$

$\boxed{-9}$

4. $f(x) = e^{x^2}$

$$\Rightarrow \lim_{h \to 0} \frac{f(h+2) - f(2)}{2h} = ?$$

$\boxed{2e^4}$

5. $f(x) = \tan x$

$$\Rightarrow \lim_{h \to 0} \frac{f\left(\frac{\pi}{6}+h\right) - f\left(\frac{\pi}{6}\right)}{h} = ?$$

$\boxed{\frac{4}{3}}$

6. $f(x) = \ln(x^2 - x^3)$

$$\Rightarrow \lim_{h \to 0} \frac{f(h-1) - f(-2h-1)}{2h} = ?$$

$\boxed{-\frac{15}{4}}$

7. $f(x) = \frac{1}{3x+1}$

$$\Rightarrow \lim_{h \to 0} \frac{f\left(h+\frac{1}{2}\right) - f\left(\frac{1}{2}\right)}{2h} = ?$$

$\boxed{-\frac{6}{25}}$

8. $f(x) = \sqrt{x} + 4x$

$$\Rightarrow \lim_{h \to 0} \frac{f(4-h) - f(4-2h)}{h} = ?$$

$\boxed{\frac{17}{4}}$

9. $f(x) = x^2 - 3x + 1$

$$\Rightarrow \lim_{h \to 0} \frac{f(h+2) - f(2h+2)}{h} = ?$$

$\boxed{-1}$

10. $\lim_{x \to 3} \frac{x^2 - 9}{x - 3} = ?$

$\boxed{6}$

11. $\lim\limits_{x \to -2} \dfrac{x^2 - x - 6}{x + 2} = ?$

-5

12. $\lim\limits_{x \to 0} \dfrac{2 - 2\cos x}{\sin x} = ?$

0

13. $\lim\limits_{x \to 4} \dfrac{\sqrt{x} - 2}{x - 4} = ?$

$\dfrac{1}{4}$

14. $\lim\limits_{x \to 0} \dfrac{3x + \sin(7x)}{\sin(5x)} = ?$

2

15. $\lim\limits_{x \to 1} \dfrac{x^3 + x^2 - 2x}{x^2 + x - 2} = ?$

1

16. $\lim\limits_{x \to 0} \dfrac{e^x - e^{-x}}{x} = ?$

2

17. $\lim\limits_{x \to \infty} \dfrac{\ln x}{\sqrt{x + 1}} = ?$

0

18. $\lim\limits_{x \to \infty} \dfrac{e^x}{x^2 + x} = ?$

∞

19. $\lim\limits_{x \to 0^+} (x \cdot \ln x) = ?$

0

20. $\lim\limits_{x \to 0^+} (x^x) = ?$

1

21. $\lim\limits_{x \to 0^+} (x \cdot \cot x) = ?$

1

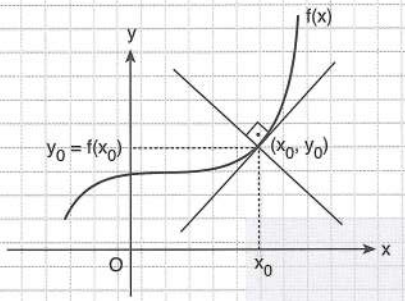
22. $\lim\limits_{x \to 1} \left((x - 1) \cdot \tan\left(\dfrac{\pi x}{2}\right)\right) = ?$

$-\dfrac{2}{\pi}$

ÖZELLİK | Property 24

Türevin Geometrik Yorumu

Geometric Interpretation of Derivative



m_T ; x_0 noktasında çizilen teğetin eğimi

in x_0 point the drawn is tangent of slope

m_N ; x_0 noktasında çizilen normalin eğimi

in x_0 point the drawn is normal's slope

Bir fonksiyonun x_0 noktasındaki türevi, o noktada çizilen teğetin eğimine eşittir.

A function's x0 derivative point is equal to that points drawn tangent's slope

$$\boxed{m_T = f'(x_0)}$$

x_0 noktasından çizilen teğet ile normal birbirine dik olduğundan

in x_0 point because the drawn tangent and normal are orthogonal (right) to each other

$$m_T \cdot m_N = -1$$

$$\Rightarrow \boxed{m_N = -\frac{1}{f'(x_0)}}$$

x_0 noktasından geçen teğetin denklemi

the equation of tangent of x_0 point

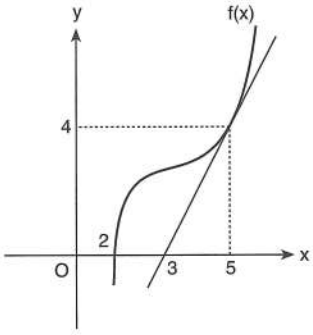
$$\boxed{y - f(x_0) = f'(x_0) \cdot (x - x_0)}$$

x_0 noktasından geçen normalin denklemi

the equation of normal of x_0 point

$$\boxed{y - f(x_0) = -\frac{1}{f'(x_0)} \cdot (x - x_0)}$$

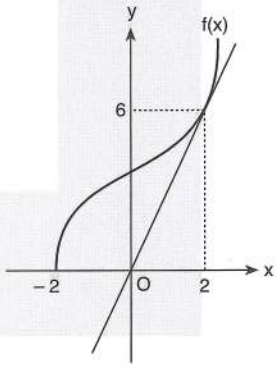
1.



$\Rightarrow f'(5) = ?$

2

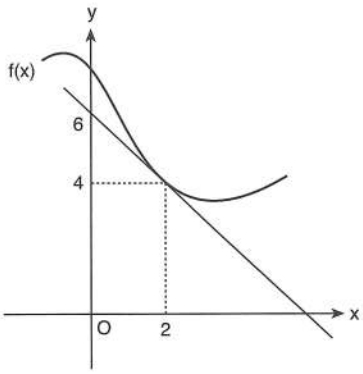
2.



$\Rightarrow f'(2) = ?$

3

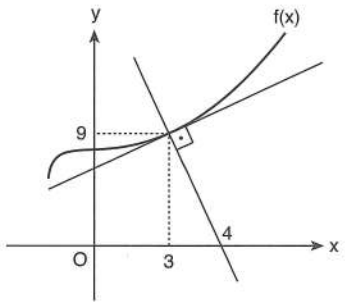
3.



$\Rightarrow f'(2) = ?$

−1

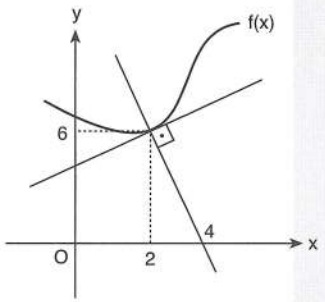
4.



$\Rightarrow f'(3) = ?$

$\frac{1}{9}$

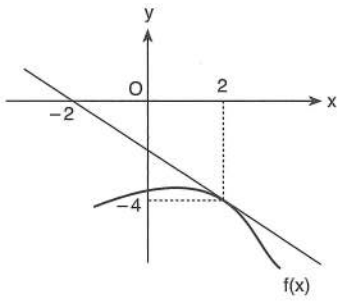
5.



$\Rightarrow f'(2) = ?$

$\frac{1}{3}$

6.

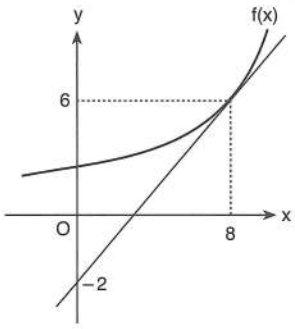


$h(x) = x \cdot f(x)$

$\Rightarrow h'(2) = ?$

-6

7.

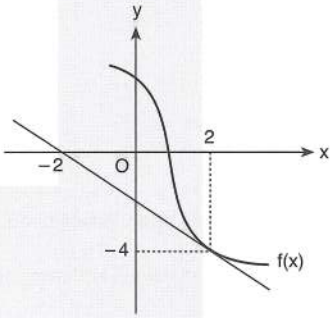


$h(x) = x^2 + f(x)$

$\Rightarrow h'(8) = ?$

17

8.

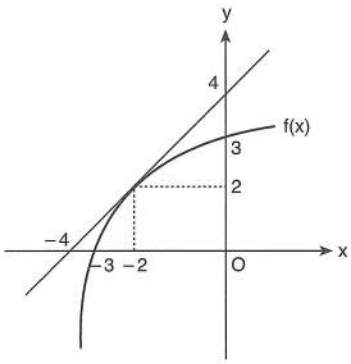


$h(x) = x^2 \cdot f(x)$

$\Rightarrow h'(2) = ?$

-20

9.



$g(x) = x^3 \cdot f(x)$

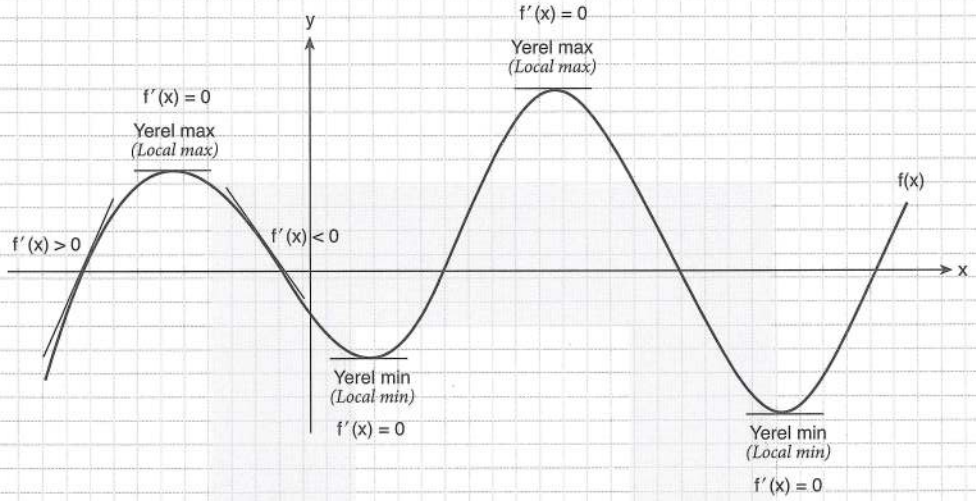
$\Rightarrow g'(-2) = ?$

16

ÖZELLİK | Property 25

Fonksiyonun 1. Türev ve 2. Türevinin Özellikleri

Functions 1st Derivative and 2nd Derivative



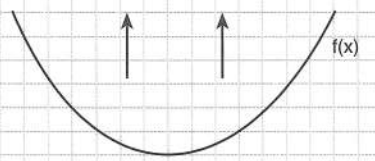
- $f'(x) > 0$ olan x değerlerinde f artan fonksiyondur. *($f'(x) > 0$ resultant x values f is increasing function.)*

  $f'(x) < 0$ olan x değerlerinde f azalan fonksiyondur. *($f'(x) < 0$ resultant x values f is decreasing function.)*

  $f'(x) = 0$ ise x noktası extremum noktasıdır. *($f'(x) = 0$ in case; x point is extremum point.)*

  (Ekstremum noktası; yerel maximum veya yerel minimum noktası)

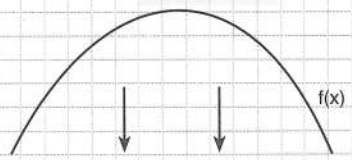
  (Extremum point is the local maximum or the local minimum point)

- 

  Eğrilik yönü yukarı doğru

  Curvature direction is pointing up

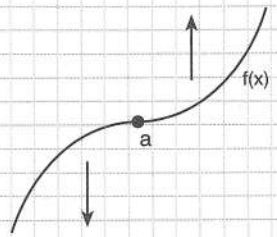
  $f''(x) > 0$

  Eğrilik yönü aşağıya doğru

  Curvature direction is pointing down

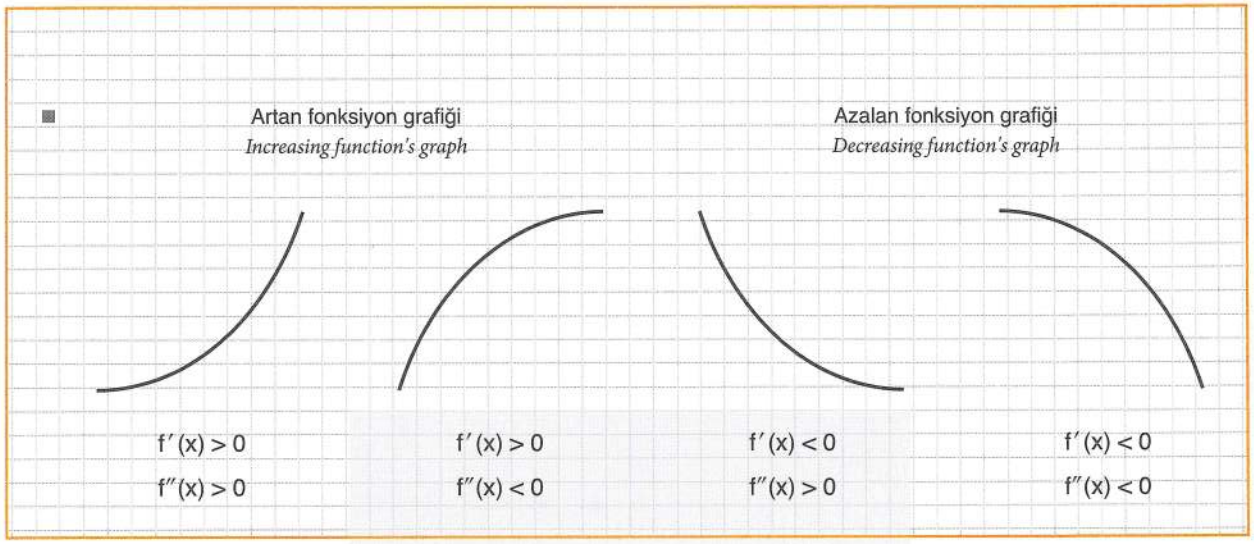
  $f''(x) < 0$

  a dönüm (büküm) noktası

  a is turn (twist) point

  $f''(a) = 0$



1. f: R → R

$y = f(x) = x^2 - 4x + 7$

⇒ min(y) = ?

3

2. f: R → R

$y = f(x) = -x^2 + 6x + 17$

⇒ max(y) = ?

26

3. f: R → R

$y = f(x) = 3x^4 - 4x^3 - 6x^2 + 12x + 9$

⇒ min(y) = ?

−2

4. f: R → R

y = f(x) = 3cosx + 4sinx

⇒ max(y) = ?

5

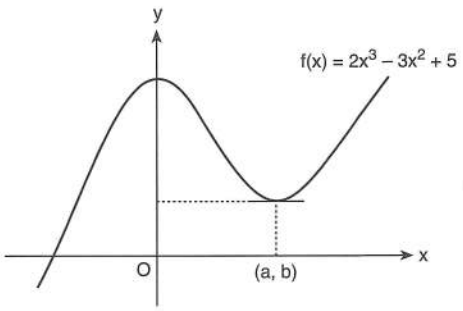
5. f: R → R

y = f(x) = 3sinx − 2cosx

⇒ min(y) = ?

$-\sqrt{13}$

6.



⇒ (a, b) = ?

(1, 4)

1. $f(x) = 4e^2$
$\Rightarrow f'(x) = ?$

A) 8e B) 4e C) 8 D) 0 E) 8x

2. $f(x) = x^3 - 2x$
$\Rightarrow f'(x) = ?$

A) 6x B) 3x – 2 C) $3x^2 - 2$ D) $x^3 - 2$ E) $3x^2$

3. $f(x) = 3x^4 - 5$
$\Rightarrow f'(x) = ?$

A) 12x B) $12x^3$ C) 12x – 5 D) $12x^3 - 5x$ E) $12x^3 + 5$

4. $f(x) = 2x^4 + 3x^2$
$\Rightarrow f'(x) = ?$

A) $8x^3 - 6x$ B) $2x^4 + 3x^2$ C) $8x^4 + 6x^2$ D) 14x E) $8x^3 + 6x$

5. $f(x) = (2x^2)^3$
$\Rightarrow f'(x) = ?$

A) $6x^2$ B) $6x^4$ C) $8x^2$ D) $16x^5$ E) $48x^5$

6. $f(x) = 2x^3 + 4x - 1$
$\Rightarrow f'(x) = ?$

A) 6x – 1 B) 2x + 4 C) $6x^2 + 4$ D) 6x + 5 E) $2x^2 - 4x$

7. $f(x) = 3x^3 - 2x^2 + 4$
$\Rightarrow f'(2) = ?$

A) 4 B) 8 C) 20 D) 28 E) 32

8. $f(x) = 4x^3 - 6x^2 - 2x + 1$
$\Rightarrow f'(1) = ?$

A) –2 B) 6 C) 18 D) 22 E) 24

9. $f(x) = x^3 + ax^2 + 3x - 2$
$f'(-1) = 10$
$\Rightarrow a = ?$

A) -3 B) -2 C) 2 D) 3 E) 6

10. $f(x) = x^{-8}$
$\Rightarrow f'(x) = ?$

A) $-8x^{-7}$ B) $8x^7$ C) $-8x^{-9}$ D) $\frac{1}{x^8}$ E) $-8x$

11. $f(x) = x^{-3} + x^{-2}$
$\Rightarrow f'(x) = ?$

A) $-3x^{-2} - 2x^{-1}$ B) $-3x^{-2} + 2x^{-1}$ C) $-3x^{-4} - 2x^{-3}$ D) $x^{-2} + x^{-1}$ E) $x^{-4} - x^{-3}$

12. $f(x) = \frac{1}{x^2} + \frac{2}{x} - 2x$

$\Rightarrow f'(-2) = ?$

A) -4 B) $-\frac{9}{4}$ C) -2 D) $\frac{5}{2}$ E) 4

13. $f(x) = \frac{2}{x^2} + \frac{1}{x} - 1$

$\Rightarrow f'(1) = ?$

A) -5 B) -3 C) -1 D) 1 E) 2

14. $f(x) = \sqrt{x}$
$\Rightarrow f'(x) = ?$

A) x B) $\frac{x}{2}$ C) $\frac{1}{2}x^{-\frac{1}{2}}$ D) $\frac{1}{2}x^{\frac{1}{2}}$ E) 0

15. $f(x) = \sqrt[3]{x}$
$\Rightarrow f'(2) = ?$

A) $\frac{1}{3} \cdot \frac{1}{\sqrt[3]{4}}$ B) $\frac{1}{3} \cdot \sqrt[3]{2}$ C) $\frac{1}{3} \cdot \sqrt[3]{4}$ D) $3 \cdot \frac{1}{\sqrt[3]{2}}$ E) $\frac{1}{3} \cdot \frac{1}{\sqrt[3]{2}}$

16. $f(x) = x^{\frac{3}{2}} + x^{\frac{1}{2}} - 6$
$\Rightarrow f'(4) = ?$

A) 6 B) $\frac{7}{4}$ C) $\frac{13}{4}$ D) $\frac{11}{3}$ E) 1

1. $f(x) = \cos x$

$\Rightarrow f'(x) = ?$

A) $-\sin x$ B) $\sin x$ C) $\cos x$ D) $-\cot x$ E) $-\cos x$

2. $y = f(x) = \sin x$

$\Rightarrow \frac{dy}{dx} = ?$

A) $\cos x$ B) $-\cos x$ C) $-\sin x$ D) $\sin x$ E) $\tan x$

3. $f(x) = e^x$

$\Rightarrow \frac{dy}{dx} = ?$

A) e B) x C) e^x D) x^2 E) e^2

4. $y = 3^x$

$\Rightarrow \frac{dy}{dx} = ?$

A) x^3 B) 3^x C) $\ln 3$ D) $3^x \cdot \ln 3$ E) $3^x \cdot \log_3 e$

5. $f(x) = \log_2 x$

$\Rightarrow \frac{df(x)}{dx} = ?$

A) $\frac{1}{x \cdot \ln 2}$ B) $\frac{\ln 2}{x}$ C) $x \cdot \log_2 e$ D) $x \cdot \ln 2$ E) 2^x

6. $f(x) = \ln x$

$\Rightarrow f'(4) = ?$

A) 4 B) 2 C) 1 D) $\frac{1}{2}$ E) $\frac{1}{4}$

7. $f(x) = 2^x$

$\Rightarrow \left.\frac{df(x)}{dx}\right|_{x=0} = ?$

A) e^2 B) 2 C) $\ln 2$ D) 2^e E) 1

8. $y = \arcsin x$

$\Rightarrow \frac{dy}{dx} = ?$

A) $\frac{1}{1+x^2}$ B) $\frac{1}{\sqrt{1-x^2}}$ C) $-\frac{1}{\sqrt{1+x^2}}$ D) $-\frac{1}{1+x^2}$ E) $\arccos x$

9. $f(x) = \arctan x$

$\Rightarrow f'(1) = ?$

A) $\frac{1}{12}$ B) $\frac{1}{4}$ C) $\frac{1}{3}$ D) $\frac{1}{2}$ E) 1

10. $f(x) = x^2 + 2x$

$\left.\frac{df(x)}{dx}\right|_{x=1} + \frac{df(1)}{dx} = ?$

A) 4 B) 5 C) 6 D) 7 E) 8

11. $f(x) = 3x^2 + \sin 30°$

$\Rightarrow f'(1) = ?$

A) 5 B) $\frac{11}{2}$ C) 6 D) $\frac{13}{2}$ E) 7

12. $f(x) = \sin x + \cos x$

$\Rightarrow f'(x) - f(x) = ?$

A) $\tan x$ B) $2\cos x$ C) $2\sin x$ D) $-2\cos x$ E) $-2\sin x$

13. $f(x, t) = 3x^2 + 5t^3 + 4x + t$

$\Rightarrow \frac{df(x,t)}{dx} = ?$

A) $3x + 5t^2$ B) $6x + 4$ C) $15t^2 + 6x$ D) $15t^2 + 1$ E) $6x + 15t^2 + 5$

14. $f(x, t) = 5x^3 + x^2 + 4t^3 + 2t$

$\Rightarrow \frac{df(x,t)}{dt} = ?$

A) $15x^2 + 2x$ B) $15x + 2$ C) $12t^2 + 2$ D) $24t$ E) $12t^3 + 2t$

15. $f(x) = x^3 + \sin x + \ln 2$

$\Rightarrow f'(x) = ?$

A) $3x^2 + \cos x$ B) $3x^2 - \cos x$ C) $x^3 + \cos x$ D) $3x^2 + \frac{1}{2}$ E) $x^2 + \cos x + \frac{1}{2}$

16. $f(x) = \cos x + \arctan(1) + 72$

$f'\left(\frac{\pi}{6}\right) = ?$

A) $-\frac{1}{2}$ B) $-\frac{1}{3}$ C) $-\frac{1}{6}$ D) $-\frac{1}{12}$ E) $-\frac{1}{24}$

1. $f(x) = (x - 2) \cdot (x + 2)$
$\Rightarrow f'(x) = ?$

A) $2x - 2$ B) $2x$ C) $2x - 2$ D) $2x + 4$ E) 4

2. $f(x) = x^2 \cdot (x - 2)$
$\Rightarrow f'(x) = ?$

A) $2x - 3$ B) $3x - 1$ C) $3x^2 - x$ D) $3x^2 - 4x$ E) $3x^2 - 2x$

3. $f(x) = 2x^3 \cdot (x^3 - 1)$
$\Rightarrow f'(x) = ?$

A) $3x^3 - 2x^3$ B) $12x^3 - 9x^2$ C) $12x^2 - 9$ D) $12x^2 - 6x$ E) $12x^5 - 6x^2$

4. $f(x) = (x^2 - 2x) \cdot (3x - x^2)$
$\Rightarrow f'(1) = ?$

A) -4 B) -1 C) 0 D) 1 E) 2

5. $f(x) = (x^2 + 1) \cdot (2x - x^3)$
$\Rightarrow f'(x) = ?$

A) $-5x^4 + 3x^3 + 6x^2 + 2$ B) $3x^2 - 6x + 2$ C) $5x^4 - 3x^2 + 2$ D) $3x^4 + 2x^2 - 2$ E) $-5x^4 + 3x^2 + 2$

6. $f(x) = (6 - 3x^4) \cdot (x^2 - 2x)$
$\Rightarrow f'(-1) = ?$

A) 6 B) 12 C) 17 D) 24 E) 36

7. $f(x) = x^2 \cdot \sin x$
$\Rightarrow f'(x) = ?$

A) $2x \cdot \sin x + x^2 \cdot \cos x$ B) $2x \cdot \cos x$ C) $-2x \cdot \cos x$ D) $2x \cdot \cos x + x^2 \cdot \sin x$ E) $2x \cdot \tan x + x^2 \cdot \cot x$

8. $f(x) = x \cdot (x + 1) \cdot (x + 2) \cdot (x + 3)$
$\Rightarrow f'(-1) = ?$

A) -4 B) -2 C) 0 D) 2 E) 4

9. $f(x) = (x^2 - 3x) \cdot g(x)$
$g(-1) = 4$
$g'(-1) = 3$
$\Rightarrow f'(-1) = ?$

A) -12 B) -8 C) 1 D) 7 E) 10

10. $f(x) = \frac{4}{x}$
$\Rightarrow f'(x) = ?$

A) $-\frac{4}{x}$ B) $-\frac{4}{x^2}$ C) 0 D) $\frac{4}{x^2}$ E) $\frac{2}{x}$

11. $f(x) = \frac{3x-2}{x-1}$
$\Rightarrow f'(x) = ?$

A) $\frac{6x-5}{x-1}$ B) $\frac{x-5}{(x-1)^2}$ C) $\frac{6x-5}{(x-1)^2}$ D) $-\frac{1}{(x-1)^2}$ E) $-\frac{5}{(x-1)^2}$

12. $f(x) = \frac{3x-2}{x-4}$
$\Rightarrow f'(5) = ?$

A) -10 B) -2 C) 4 D) 10 E) 16

13. $f(x) = \tan x$
$\Rightarrow f'(x) = ?$

A) $1 + \tan^2 x$ B) $\frac{1}{\sin^2 x}$ C) $-\sec^2 x$ D) $1 - \tan^2 x$ E) $1 + \cot^2 x$

14. $y = \frac{x^2 + 2x}{e^x}$
$\Rightarrow \left.\frac{dy}{dx}\right|_{x=0} = ?$

A) 1 B) 2 C) 4 D) e E) e^2

15. $f(x) = \frac{\arctan x}{x}$
$\Rightarrow f'(1) = ?$

A) $\frac{\pi}{4}$ B) $1 + \frac{\pi}{4}$ C) $\frac{2-\pi}{2}$ D) $\frac{\pi+2}{2}$ E) $\frac{2-\pi}{4}$

16. $h(x) = \frac{f(x)}{g(x)}$
$f(2) = 3$
$f'(2) = 1$
$g(2) = 2$
$g'(2) = 6$
$\Rightarrow h'(2) = ?$

A) -5 B) -4 C) 1 D) 4 E) 5

1. $f(x) = (2x^2 + x)^3$
$\Rightarrow f'(x) = ?$

A) $3(2x^2 + x)$ B) $3(x^2 + 1)$
C) $3(2x^2 + 4x + 1)$ D) $3(2x^2 + x)^2 \cdot (4x + 1)$
E) $12x(2x^2 + x)$

2. $f(x) = (x^2 + 3x)^2$
$\Rightarrow f'(1) = ?$

A) 8 B) 10 C) 20 D) 40 E) 45

3. $f(x) = (x^2 - 3x - 4)^3$
$\Rightarrow f'(-1) = ?$

A) –105 B) –14 C) 0 D) 18 E) 105

4. $f(x) = (x^2 - 3x^3)^2 + 4x^2$
$\Rightarrow f'(1) = ?$

A) 36 B) 28 C) 14 D) –7 E) –28

5. $f(x) = \dfrac{4}{(x^2 - 3)^2}$

$\Rightarrow f'(-2) = ?$

A) – 64 B) – 32 C) $\frac{1}{8}$ D) $\frac{1}{64}$ E) 32

6. $f(x) = \sqrt{x+3}$
$\Rightarrow f'(1) = ?$

A) $\frac{1}{2\sqrt{2}}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{\sqrt{2}}{4}$ D) $\frac{1}{4}$ E) $\sqrt{2}$

7. $f(x) = \sqrt{4x^2 - 2}$
$\Rightarrow f'(1) = ?$

A) $\sqrt{2}$ B) 2 C) $2\sqrt{2}$ D) 4 E) 6

8. $f(x) = \frac{x}{5} + \sqrt{x^2 + 9}$
$\Rightarrow f'(4) = ?$

A) $\frac{4}{5}$ B) $\frac{5}{6}$ C) 1 D) $\frac{5}{4}$ E) $\frac{7}{3}$

9. $f(x) = \sin^2 x$
$\Rightarrow f'(x) = ?$

A) $2\sin x$ B) $\sin(2x)$ C) $2\sin(2x)$ D) $-2\cos x$ E) $2\cos x$

10. $f(x) = \cos(x^2)$
$\Rightarrow f'(x) = ?$

A) $\sin(x^2)$ B) $2 \cdot \sin(x^2)$ C) $\cos(x^2) \cdot (2x)$ D) $\sin(x^2) \cdot (2x)$ E) $-\sin(x^2) \cdot (2x)$

11. $f(x) = e^{3x}$
$\Rightarrow f'(x) = ?$

A) e^{3x} B) $\frac{e^{3x}}{3}$ C) $e^{3x} \cdot 3x$ D) $e^{3x} \cdot 3$ E) $\frac{e^{3x}}{3x}$

12. $f(x) = 5^{(x^2)}$
$\Rightarrow f'(1) = ?$

A) $5 \ln 5$ B) $10 \ln 5$ C) $\frac{5}{\ln 5}$ D) $2 \ln 5$ E) $4 \ln 5$

13. $f(x) = \ln(7x)$
$\Rightarrow f'(x) = ?$

A) $\frac{1}{7}$ B) $\frac{1}{7x}$ C) $\frac{1}{x}$ D) $\frac{7}{x}$ E) 7

14. $f(x) = \ln(\sin x)$
$\Rightarrow f'\left(\frac{\pi}{4}\right) = ?$

A) -1 B) $-\frac{\sqrt{2}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) 1 E) 2

15. $f(x) = \cos^2(5x)$
$\Rightarrow f'(x) = ?$

A) $\sin(5x)$ B) $-\sin(5x)$ C) $-\sin(10x)$ D) $-5 \cdot \sin(10x)$ E) $-5 \cdot \sin(5x)$

16. $f(x) = \arctan(x^2)$
$\Rightarrow f'(2) = ?$

A) $\frac{1}{17}$ B) $\frac{1}{16}$ C) $\frac{1}{4}$ D) $\frac{2}{15}$ E) $\frac{4}{17}$

1. $f(x) = 3x - 1$
$g(x) = x^2 + 2$
$\Rightarrow (fog)'(x) = ?$

A) $6x$ B) $6x^2 + 12$ C) $6x - 3$ D) $3x^2 - 6$ E) $3x^2 + 6$

2. $f(x) = 2x^2 + 5x$
$g(x) = x^2 - 3$
$\Rightarrow (fog)'(x) = ?$

A) $8x^2 - 1$ B) $4x^2 + 4$ C) $x^2 + 6$ D) $8x^3 - 14x$ E) $8x^3 - x$

3. $f(x) = x^3 - 3$
$g(x) = 3x^2 + 1$
$\Rightarrow (fog)'(1) = ?$

A) 252 B) 288 C) 300 D) 312 E) 324

4. $f(x) = \sin^2 x$
$g(x) = x^2 + 1$
$\Rightarrow (gof)'\left(\frac{\pi}{2}\right) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

5. $f(x) = x^2 + 1$
$g(x) = \sin x$
$\Rightarrow (fog)'(x) = ?$

A) $\sin(2x)$ B) $\sin x + 1$ C) $\sin x \cdot \cos x$ D) $\cos x - \sin x$ E) 0

6. $f(x) = x^2$
$g(x) = \frac{1}{x^2}$
$\Rightarrow (gof)'(1) = ?$

A) -4 B) $-\frac{4}{5}$ C) 1 D) $\frac{1}{5}$ E) 4

7. $\left.\begin{array}{l} g'(-1) = 5 \\ g(-1) = 3 \\ f'(3) = 4 \end{array}\right\} \Rightarrow (fog)'(-1) = ?$

A) 10 B) 15 C) 16 D) 20 E) 24

8. $g(x) = f(x^2 - 1)$
$\Rightarrow g'(4) = ?$

A) $8 \cdot f'(4)$ B) $2 \cdot f'(4)$ C) $8 \cdot f'(15)$ D) $8 \cdot f'(16)$ E) $4 \cdot f'(15)$

9. $f(3x-1) = \dfrac{x^2}{x+1}$

$\Rightarrow f'(5) = ?$

A) 1 B) $\frac{1}{4}$ C) $\frac{8}{9}$ D) $\frac{8}{27}$ E) $\frac{1}{16}$

10. $f(x^2 - g(x)) = 2x - 5$

$g(2) = 4$

$g'(2) = 1$

$\Rightarrow f'(0) = ?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) 1 D) $\frac{4}{3}$ E) 4

11. $f(x-3) = 3x + 5$

$g(x) = x^3 - x$

$\Rightarrow (fog)'(-1) = ?$

A) -12 B) 6 C) 10 D) 12 E) 18

12. $f(x) = 2x - 1$

$g(x) = x^2$

$h(x) = \sqrt{x}$

$\Rightarrow (fogoh)'(2) = ?$

A) -6 B) -2 C) 2 D) 4 E) 8

13. $f(x) = \ln x$

$g(x) = e^{x^2-1}$

$\Rightarrow (fog)'(x) = ?$

A) x B) $2x$ C) e^{x^2-1} D) $2e^{x^2+1}$ E) $2e^{x^2-1}$

14. $g(x) = \arctan(x^2)$

$f(x) = 2x$

$\Rightarrow (gof)'(1) = ?$

A) -1 B) $\frac{2}{7}$ C) $\frac{4}{17}$ D) $\frac{8}{17}$ E) $\frac{2}{5}$

15. $f(x) = \log_5(x+1)$

$g(x) = x^3$

$\Rightarrow (fog)'(2) = ?$

A) $2 \cdot \ln 5$ B) $4 \cdot \ln 5$ C) $\frac{2}{\ln 5}$ D) $\frac{4}{3 \cdot \ln 5}$ E) $\frac{8}{\ln 5}$

16. $f(x) = 3x$

$g(x) = x^2$

$h(x) = x^2 - 2x$

$\Rightarrow (hofog)'(1) = ?$

A) 12 B) 18 C) 24 D) 30 E) 36

1. $f(x) = 3x + \cos x$
$\Rightarrow f'(\pi) = ?$

A) 3 B) $\frac{5}{2}$ C) 2 D) –1 E) $3 - \frac{\sqrt{3}}{2}$

2. $f(x) = 2\sin x \cdot \cos x$
$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

A) – 2 B) – 1 C) 0 D) 1 E) 2

3. $f(x) = x^3 + \sin(4x)$
$\Rightarrow f'(0) = ?$

A) – 4 B) – 2 C) 0 D) 2 E) 4

4. $f(x) = \dfrac{\sin(2x)}{1 - \cos(2x)}$
$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

A) – 2 B) –1 C) $\frac{1}{2}$ D) 1 E) 2

5. $f(x) = (\cos x + \sin x)^2$
$\Rightarrow f'(\pi) = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

6. $f(x) = \sin(\cos x)$
$\Rightarrow f'(0) = ?$

A) –1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

7. $f(x) = \sin(\cos(4x))$
$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

A) – 4 B) –1 C) 0 D) 1 E) 4

8. $f(x) = \tan x \cdot \cos x$
$\Rightarrow f'\left(\frac{\pi}{4}\right) = ?$

A) – 2 B) $-\frac{\sqrt{2}}{2}$ C) 0 D) 2 E) $\frac{\sqrt{2}}{2}$

9. $f(x) = \cot(2x) + \tan x$

$\Rightarrow f'\left(\frac{\pi}{3}\right) = ?$

A) -4 B) $-\frac{4}{3}$ C) 1 D) $\frac{4}{3}$ E) 8

10. $f(x) = \sin(\cot(2x))$

$\Rightarrow f'\left(\frac{\pi}{4}\right) = ?$

A) -2 B) -1 C) 0 D) $\sqrt{3}$ E) 2

11. $f(x) = \cos\left(\frac{\pi}{4} \cdot \sin\left(\frac{\pi}{4}x\right)\right)$

$\Rightarrow f'(2) = ?$

A) $-\frac{\pi^2}{32}$ B) $-\frac{\pi^2}{16}$ C) 0 D) $\frac{\pi^2}{16}$ E) $\frac{\pi^2}{32}$

12. $f(x) = \tan(\cot x)$

$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

13. $f(x) = \frac{\tan x + 1}{\tan x - 1}$

$\Rightarrow f'(0) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

14. $\frac{d}{dx}\left(\sin^2(2x)\right) = ?$

A) $2 \cdot \sin(4x)$ B) $\sin(2x)$ C) $\sin x$ D) $\cos(2x)$ E) $-2 \cdot \sin(2x)$

15. $f(x) = 2\sin^2\left(\frac{x}{2}\right)$

$\Rightarrow f'(\pi) = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

16. $f(x) = \frac{\cos x}{\sin x} + 1$

$\Rightarrow f'\left(\frac{\pi}{4}\right) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

1. $f(x) = e^x$
$\Rightarrow f'(2) = ?$

A) e^{-2} B) e^{-1} C) 1 D) e E) e^2

2. $f(x) = x + e^{3x+1}$
$\Rightarrow f'(1) = ?$

A) 4 B) 5 C) 6e D) 3e + 4 E) $3e^4 + 1$

3. $f(x) = 3^{2x+1}$
$\Rightarrow f'(-1) = ?$

A) $\frac{2}{3}\ln 3$ B) $3\ln 3$ C) $\frac{3}{2}\ln 2$ D) 6 E) 12

4. $f(x) = 4^x \cdot e^{x^2+1}$
$\Rightarrow f'(0) = ?$

A) 1 B) 4e C) $4 \cdot \ln 4$ D) $\ln 4$ E) $e \cdot \ln 4$

5. $e^x \cdot \frac{d}{dx}\left(x^3 \cdot e^{-x}\right) = ?$

A) $x^2 - 3x$ B) $x^2 + 3x$ C) $3x^2 - x^3$ D) $x^3 + x$ E) $x^3 - 3x$

6. $f(x) = 2^{\sin x}$
$\Rightarrow f'(\pi) = ?$

A) $-\frac{1}{\ln 2}$ B) $-\ln 2$ C) $\frac{1}{\ln 2}$ D) $\ln 2$ E) 2

7. $f(x) = \ln(3^{\sin(2x)})$
$\Rightarrow f'(\pi) = ?$

A) $-2 \cdot \ln 3$ B) $\ln 3$ C) $2 \cdot \ln 3$ D) $3 \cdot \ln 3$ E) $6 \cdot \ln 3$

8. $f(x) = \sin x \cdot e^x$
$\Rightarrow f'(0) = ?$

A) e^2 B) e C) $\frac{1}{e}$ D) 1 E) 0

9. $f(x) = e^{kx} \cdot \ln x$
$f'(1) = e^{-e}$
$\Rightarrow k = ?$

A) e B) $\frac{1}{e}$ C) 1 D) $-\frac{1}{e}$ E) $-e$

10. $f(x) = e^{x+1} \cdot \ln(x^2 + 1)$
$\Rightarrow f'(1) = ?$

A) e^2 B) $e^2 \cdot \ln(2e)$ C) $\frac{2}{\ln e}$ D) $\frac{2}{e^2}$ E) 2

11. $f(x) = e^{\sin x} + \ln(\cos x)$
$\Rightarrow f'(0) = ?$

A) $e + 1$ B) $2 + e$ C) e D) 1 E) -1

12. $f(e^x) = \cos(\ln x)$
$\Rightarrow f'(e) = ?$

A) -1 B) 0 C) 1 D) e E) e^2

13. $f(x) = e^x - x$
$g(x) = \ln x - x^2$
$\Rightarrow (fog)'(1) = ?$

A) $1 - e$ B) 0 C) $e + 1$ D) $1 - \frac{1}{e}$ E) 1

14. $f(x) = e^x + \ln x$
$g(x) = e^{x+1}$
$\Rightarrow (gof)'(1) = ?$

A) e^{e+2} B) e^2 C) $(e + 1) \cdot e^{e+1}$ D) e^{e+3} E) $\frac{1}{e+3}$

15. $f(x) = \arcsin(3^x)$
$\Rightarrow f'(-1) = ?$

A) $\frac{\sqrt{2} \cdot \ln 3}{4}$ B) $\frac{\sqrt{6} \cdot \ln 3}{12}$ C) $\frac{\ln 3}{12}$ D) $\frac{\ln 3}{4}$ E) $\frac{\sqrt{3} \cdot \ln 3}{4}$

16. $f(x) = e^{x+1}$
$\Rightarrow (f^{-1})'(2) = ?$

A) -2 B) $-\frac{1}{2}$ C) 1 D) $\frac{1}{2}$ E) 2

1. $f(x) = \log x$
$\Rightarrow f'(2) = ?$

A) $\frac{\log e}{2}$ B) $\frac{1}{2 \cdot \log e}$ C) $\log e$ D) 1 E) $\ln 10$

2. $f(x) = \ln(x + 1)$
$\Rightarrow f'(3) = ?$

A) 1 B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{1}{4}$ E) $\frac{1}{8}$

3. $f(x) = \ln(x^2 + x)$
$\Rightarrow f'(1) = ?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) $\frac{2}{3}\ln 2$ E) $\frac{3}{2}\ln 2$

4. $f(x) = \log_3 x^2$
$\Rightarrow f'(2) = ?$

A) 1 B) $\ln 3$ C) $\frac{1}{\ln 3}$ D) $\frac{2}{\ln 3}$ E) $2\ln 3$

5. $f(x) = \log_5(x^2 + x)$
$\Rightarrow f'(1) = ?$

A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) $\frac{5}{6}\ln 5$ D) $\frac{2}{3}\ln 5$ E) $\frac{3}{2}\log_5 e$

6. $f(x) = \ln(\log x)$
$\Rightarrow f'(10) = ?$

A) $\frac{1}{10}$ B) $\ln 10$ C) $10 \cdot \ln 10$ D) $\frac{1}{10 \cdot \ln 10}$ E) 1

7. $f(x) = \ln(\cos x)$
$\Rightarrow f'\left(\frac{\pi}{3}\right) = ?$

A) $-2\sqrt{3}$ B) $-\sqrt{3}$ C) $-\frac{\sqrt{3}}{3}$ D) $\sqrt{3}$ E) $2\sqrt{3}$

8. $f(x) = \ln^2(x^2 - 1)$
$\Rightarrow f'(2) = ?$

A) 8 B) $\ln 2$ C) $\ln 3$ D) $\frac{8}{3}$ E) $\frac{8}{3}\ln 3$

9. $f(x) = \ln(2 \cdot \ln(x^3))$
$\Rightarrow f'(e) = ?$

A) $\frac{3}{e}$ B) $\frac{1}{e}$ C) 2 D) e E) 3e

10. $f(x) = x - x \cdot \ln x$
$\Rightarrow f'(1) = ?$

A) e B) e – 1 C) 0 D) 1 – e E) e + 1

11. $f(x) = \ln(3x + 1)$
$\Rightarrow (f^{-1})'(0) = ?$

A) 2 B) 1 C) $\frac{1}{3}$ D) 0 E) $-\frac{1}{3}$

12. $F(x, y) = \ln x + \ln y = 0$
$\Rightarrow F'\left(\frac{1}{4}, 4\right) = ?$

A) –16 B) – 4 C) 0 D) 1 E) 4

13. $F(x, y) = \ln(x + y) + x = 0$
$\Rightarrow F'(0, 1) = ?$

A) –3 B) –2 C) $\frac{1}{2}$ D) $\frac{3}{2}$ E) 3

14. $f(x) = \arctan(\ln x)$
$\Rightarrow f'(1) = ?$

A) –1 B) 0 C) $\frac{1}{2}$ D) 1 E) 2

15. $f(x) = \arcsin(\ln^2 x)$
$\Rightarrow f'(1) = ?$

A) –1 B) $-\frac{1}{e}$ C) 0 D) $\frac{1}{e}$ E) $\frac{2}{e}$

16. $x = t^2 \cdot \ln 4$
$y = \log_4(t + 2)$
$\Rightarrow \left.\frac{dx}{dy}\right|_{t=1} = ?$

A) 6 B) $6 \cdot \ln^2 4$ C) $\frac{2}{3}$ D) $\frac{2}{3}\ln^2 4$ E) 1

1. $y = 3t - 1$
$x = t + 2$
$\Rightarrow \frac{dy}{dx} = ?$

A) 1 B) 2 C) 2t D) 3 E) 3t

2. $\left.\begin{array}{l} y = t^3 - 2t^2 \\ x = t^4 - 2t \end{array}\right\}$
$\Rightarrow \frac{dy}{dx} = ?$

A) $\frac{3t^2 - 4t}{4t^3 - 2}$ B) $3t^2 - 4$ C) $6t^2 - 4$ D) $\frac{3t - 4}{4t^3 - 2}$ E) $\frac{4t^3 - 2}{3t^2 - 4t}$

3. $x = t^2 - t$
$y = t^3 - 2$
$\Rightarrow \left.\frac{dy}{dx}\right|_{t=1} = ?$

A) -3 B) $-\frac{1}{3}$ C) 1 D) $\frac{3}{2}$ E) 3

4. $x = 2t$
$y = 3t^2$
$\Rightarrow \frac{dy}{dx} = ?$

A) $\frac{3x}{2}$ B) $3x$ C) $4x$ D) $3x + 2$ E) $\frac{3x}{2} + 1$

5. $x = t + 1$
$y = t^2 + 2t$
$\Rightarrow \frac{dy}{dx} = ?$

A) $\frac{x}{2}$ B) x C) $2x$ D) $x + 1$ E) $2x + 1$

6. $x = \sin t$
$y = \cos t$
$\Rightarrow \frac{dy}{dx} = ?$

A) $-\tan t$ B) $-\cot t$ C) -1 D) 1 E) $\tan t$

7. $x = \sin t + 1$
$y = \sin t + t$
$\Rightarrow \left.\frac{dy}{dx}\right|_{t=0} = ?$

A) -1 B) 0 C) $\frac{1}{2}$ D) 1 E) 2

8. $x = t^2 - \cos t$
$y = -t + \sin t$
$\Rightarrow \left.\frac{dx}{dy}\right|_{t=\pi} = ?$

A) π B) $-\pi$ C) $2\pi - 1$ D) $\pi + 1$ E) 1

9. $x = t - \sin t$

$y = t - 2$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=\frac{\pi}{2}} = ?$

A) π B) $\frac{\pi}{2}$ C) $\frac{\pi}{4}$ D) 0 E) 1

10. $x = 2 - \cos t$

$y = 1 + \sin t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=\frac{\pi}{6}} = ?$

A) $-\sqrt{3}$ B) $-\frac{1}{\sqrt{3}}$ C) $\frac{1}{\sqrt{3}}$ D) 1 E) $\sqrt{3}$

11. $x = 3 \cdot \cos^2 t$

$y = 3 \cdot \sin^2 t$

$\Rightarrow \frac{dy}{dx} = ?$

A) 1 B) $3 \cdot \sin t$ C) $\tan t$ D) $\cos t$ E) -1

12. $x = t + 4$

$y = t^2 - 2t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{x=2} = ?$

A) -6 B) $-\frac{1}{2}$ C) $-\frac{1}{6}$ D) $\frac{1}{6}$ E) 6

13. $0 < t < \frac{\pi}{2}$

$x = \tan t$

$y = \sin t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{y=\frac{\sqrt{2}}{2}} = ?$

A) $-\sqrt{2}$ B) -1 C) $\frac{\sqrt{2}}{4}$ D) $\sqrt{2}$ E) $2\sqrt{2}$

14. $x = t^3 + 1$

$y = t^2 + 3t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=1} = ?$

A) $\frac{5}{3}$ B) 2 C) $\frac{5}{2}$ D) 3 E) 7

15. $x = t^3 - 1$

$y = t^2 + 2t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=1} = ?$

A) -1 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 1 E) $\frac{4}{3}$

16. $x = t - \sin t$

$y = t + \cos t$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=\pi} = ?$

A) $-\frac{1}{2}$ B) 0 C) $\frac{1}{2}$ D) 1 E) 2

1. $x^2 - y^2 + y = 0$

$\frac{dy}{dx} = ?$

A) $\frac{x-1}{2y}$ B) $\frac{1-2x}{2y}$ C) $\frac{2x-1}{2y}$ D) $\frac{2x}{1-2y}$ E) $\frac{2x}{2y-1}$

2. $F(x, y) = x^3 + 2xy^2 - y - 4 = 0$

$\Rightarrow F'(1, -1) = ?$

A) $-\frac{5}{3}$ B) -1 C) 1 D) $\frac{5}{3}$ E) 2

3. $a \in R$

$F(x, y) = x^3 - 2x^2 - y = 0$

$\Rightarrow F'(-1, a) = ?$

A) -7 B) -5 C) -1 D) 5 E) 7

4. $F(x, y) = xy + y^2 - 3 = 0$

$\Rightarrow F'(2, 1) = ?$

A) $-\frac{1}{4}$ B) $-\frac{1}{5}$ C) -1 D) $\frac{1}{5}$ E) $\frac{1}{4}$

5. $F(x, y) = x^3y^2 - x^2 = 0$

$\Rightarrow F'(1, 1) = ?$

A) -2 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 1 E) 2

6. $a \in R$

$F(x, y) = x^2 - y^2 + axy - 3 = 0$

$F'(2, 1) = 2$

$\Rightarrow a = ?$

A) $-\frac{1}{2}$ B) 0 C) $\frac{1}{2}$ D) 1 E) 2

7. $a \in R$

$F(x, y) = x^3 - ay^2 + xy + \frac{1}{2} = 0$

$F'(1, 1) = 1$

$\Rightarrow a = ?$

A) $-\frac{5}{2}$ B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) $\frac{5}{2}$

8. $y^2 - x\ln y - 1 = 0$

$\Rightarrow \left.\frac{dy}{dx}\right|_{\substack{x=1\\y=1}} = ?$

A) -2 B) 0 C) e D) $\frac{3}{2}$ E) $2e$

9. $F(x, y) = \ln(x - y) + 2y - x^2 + 2 = 0$
$\Rightarrow F'(2, 1) = ?$

A) -3 B) 0 C) $\frac{1}{2}$ D) 1 E) 3

10. $F(x, y) = \sin x + \cos y = 0$
$\Rightarrow F'\left(0, \frac{\pi}{2}\right) = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

11. $2x^2 - 2y = \sin(x + y)$
$\Rightarrow \left.\frac{dy}{dx}\right|_{\substack{x=0\\y=\pi}} = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

12. $\tan(x + y) = x + y$
$\Rightarrow \frac{dy}{dx} = ?$

A) $\frac{\sin^2(x-y)}{1+\cos(x-y)}$ B) $\frac{\sin(x-y)}{\cos^2(x-y)+1}$

C) $\frac{\sin^2(x-y)}{1+\cos^2(x-y)}$ D) 1

E) -1

13. $F(x, y) = y + x \cdot \cos y + y \cdot \sin x - \frac{\pi}{2} = 0$
$\Rightarrow F'\left(0, \frac{\pi}{2}\right) = ?$

A) $-\frac{1}{2}$ B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $-\frac{\pi}{2}$ E) $\frac{\pi}{2}$

14. $F(x, y) = \tan^2 x - \tan(x + y) = 0$
$\Rightarrow F'\left(\frac{\pi}{4}, 0\right) = ?$

A) -2 B) -1 C) 0 D) 1 E) 3

15. $F(x, y) = x^3 + y^3 - xy - 1 = 0$
$\Rightarrow F'(1, 0) = ?$

A) -3 B) $-\frac{1}{3}$ C) $\frac{1}{3}$ D) $\frac{2}{3}$ E) 3

16. $F(x, y) = \sin x - \tan y + k = 0$
$\Rightarrow F'\left(\frac{\pi}{3}, \frac{\pi}{4}\right) = ?$

A) $-\frac{1}{4}$ B) $-\frac{1}{2}$ C) $\frac{1}{4}$ D) 2 E) 4

1. $f(x) = 4x - 3$
$\Rightarrow (f^{-1})'(x) = ?$

A) 4 B) 2 C) $\frac{1}{2}$ D) $\frac{1}{4}$ E) $\frac{1}{8}$

2. $f: R \setminus \{2\} \to R \setminus \{0\}$
$f(x) = \frac{4}{x-2}$
$\Rightarrow (f^{-1})'(2) = ?$

A) -1 B) $-\frac{1}{2}$ C) $\frac{1}{4}$ D) $\frac{1}{2}$ E) 2

3. $f: R \setminus \left\{\frac{1}{2}\right\} \to R \setminus \left\{\frac{1}{2}\right\}$
$f(x) = \frac{x-4}{2x-1}$
$\Rightarrow (f^{-1})'(1) = ?$

A) -5 B) -3 C) 2 D) 4 E) 7

4. $f: R^+ \to [-1, +\infty)$
$f(x) = x^2 - 1$
$\Rightarrow (f^{-1})'(2) = ?$

A) $\frac{1}{8}$ B) $\frac{1}{4}$ C) $\frac{1}{2\sqrt{3}}$ D) $\frac{1}{\sqrt{3}}$ E) $\sqrt{3}$

5. $f: [1, \infty) \to [2, \infty)$
$f(x) = (x-1)^2 + 2$
$\Rightarrow (f^{-1})'(11) = ?$

A) $\frac{1}{9}$ B) $\frac{1}{8}$ C) $\frac{1}{6}$ D) $\frac{1}{3}$ E) 1

6. $f: [1, \infty) \to R^+$
$f(x) = x^2 - 2x + 1$
$\Rightarrow (f^{-1})'(9) = ?$

A) $\frac{1}{6}$ B) $\frac{1}{4}$ C) $\frac{1}{3}$ D) $\frac{1}{2}$ E) $\frac{2}{3}$

7. $f: R^+ \to R$
$f(x) = \sqrt{x}$
$\Rightarrow (f^{-1})'(3) = ?$

A) 12 B) 8 C) 6 D) 4 E) 2

8. $f: [2, \infty) \to [4, \infty)$
$f(x) = \sqrt{x-2} + 4$
$\Rightarrow (f^{-1})'(6) = ?$

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) 1 D) 2 E) 4

9. $f(x) = \sqrt[3]{x}$

$\Rightarrow (f^{-1})'(2) = ?$

A) 12 B) 9 C) 4 D) $\sqrt[3]{2}$ E) 1

10. $0 < x < \frac{\pi}{2}$

$f(x) = \sin x$

$\Rightarrow (f^{-1})'\left(\frac{1}{2}\right) = ?$

A) $\frac{2}{3}$ B) $\frac{1}{2}$ C) $\frac{2\sqrt{3}}{3}$ D) $\frac{\sqrt{3}}{2}$ E) $\frac{\sqrt{2}}{2}$

11. $f(x) = \arctan x$

$\Rightarrow f'(2) = ?$

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{5}$ D) 1 E) 5

12. $f(x) = \text{arccot}(\sin x)$

$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

A) $-\frac{1}{4}$ B) $-\frac{1}{2}$ C) -1 D) 0 E) $\frac{1}{2}$

13. $f(x) = \arcsin(x^2)$

$\Rightarrow f'\left(\frac{1}{2}\right) = ?$

A) $\frac{4}{\sqrt{15}}$ B) $\frac{2}{\sqrt{15}}$ C) $\frac{1}{2\sqrt{15}}$ D) $-\frac{2}{\sqrt{15}}$ E) $-\frac{4}{\sqrt{15}}$

14. $f(x) = x \cdot \arctan x$

$\Rightarrow f'(1) = ?$

A) $\frac{\pi}{2} + 1$ B) $\frac{\pi + 1}{2}$ C) $\frac{\pi}{4} + 1$ D) $\frac{\pi + 2}{4}$ E) $\frac{\pi + 1}{4}$

15. $0 < x < \frac{\pi}{2}$

$f(x) = \text{arccot}(\sin x)$

$\sin x = \frac{3}{5}$

$\Rightarrow f'(x) = ?$

A) $-\frac{15}{31}$ B) $-\frac{10}{17}$ C) $\frac{1}{17}$ D) $\frac{5}{34}$ E) $\frac{17}{15}$

16. $f(x) = \cos(\arctan x)$

$\Rightarrow f'(1) = ?$

A) $-\frac{\sqrt{2}}{4}$ B) $-\frac{\sqrt{2}}{2}$ C) $\frac{1}{2}$ D) $\frac{\sqrt{2}}{2}$ E) $\frac{\sqrt{2}}{4}$

1. $f(x) = x^x$
$\Rightarrow f'(x) = ?$

A) $x^x \cdot (x + 1)$ B) x C) $x \cdot \ln x$ D) $x^x \cdot \ln x$ E) $x^x \cdot (1 + \ln x)$

2. $f(x) = x^{3x}$
$\Rightarrow f'(1) = ?$

A) $3 + \ln 1$ B) $3 + \ln 3$ C) $\ln 3$ D) 3 E) $\ln 3 - 3$

3. $f(x) = x^{-x}$
$\Rightarrow f'(1) = ?$

A) -2 B) -1 C) $-\frac{1}{2}$ D) 0 E) $\frac{1}{2}$

4. $f(x) = x^{x+3}$
$\Rightarrow f'(1) = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

5. $f(x) = (x + 2)^x$
$\Rightarrow f'(-1) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

6. $f(x) = (x + 2)^{x+2}$
$\Rightarrow f'(-1) = ?$

A) 2 B) 1 C) $\frac{1}{2}$ D) $\frac{1}{4}$ E) 0

7. $f(x) = (\cos x)^x$
$\Rightarrow f'(0) = ?$

A) $-\frac{1}{2}$ B) $-\frac{1}{4}$ C) 0 D) 1 E) $\frac{1}{2}$

8. $f(x) = (\sin x)^x$
$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

A) 0 B) $\frac{1}{2}$ C) 1 D) $\sqrt{2}$ E) 2

9. $f(x) = 2x^4$

$\Rightarrow f''(2) = ?$

A) 24 B) 48 C) 54 D) 96 E) 108

10. $f(x) = x^6 + x^5$

$\Rightarrow f''(-1) = ?$

A) –20 B) –10 C) 0 D) 10 E) 20

11. $f(x) = x^2 - 4x$

$\Rightarrow f''(3) = ?$

A) –11 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 2

12. $y = x^3 - 2x^2 + 5x + 1$

$\Rightarrow \frac{d^3y}{dx^3} = ?$

A) 2 B) 4 C) 6 D) 4x E) 6x

13. $y = (3x + 1)^{-2}$

$\Rightarrow \frac{d^9y}{dx^9} = ?$

A) $-\frac{3^{10} \cdot 11!}{(3x+1)^{12}}$ B) $\frac{3^{10}.11!}{(3x+1)^{11}}$ C) $\frac{3^9.10!}{(3x+1)^{11}}$

D) $\frac{3^{10}}{(3x+1)^{11}}$ E) $-\frac{3^9 \cdot 10!}{(3x+1)^{11}}$

14. $y = e^{2x} - e^{-2x}$

$\Rightarrow \left.\frac{d^{89}y}{dx^{89}}\right|_{x=0} = ?$

A) 0 B) 1 C) 2 D) 2^{89} E) 2^{90}

15. $f(x) = \sin(2x) - \cos(2x)$

$f^{(10)}(x)$ in f(x) türünden değeri aşağıdakilerden hangisidir?

Which of the following is the value of $f^{(10)}(x)$ of f(x) type?

A) $2^{10} \cdot f(x)$ B) $-2^{10} \cdot f(x)$ C) $10 \cdot f(x)$

D) $-10 \cdot f(x)$ E) $f^{10}(x)$

16. $f(x) = \frac{3}{x}$

$\Rightarrow f^{(30)}(3) = ?$

A) 3^{-31} B) $30! \cdot 3^{-31}$ C) $30! \cdot 3^{-32}$

D) $30! \cdot 3^{-30}$ E) $31! \cdot 3^{-30}$

1. $\lim\limits_{x \to a} \dfrac{f(x) - f(a)}{x - a} = ?$

A) $f'(x)$ B) $f(a)$ C) $f(x)$ D) $f'(a)$ E) $f(x - a)$

2. $f(x) = 3x + 1$

$\Rightarrow \lim\limits_{x \to 2} \dfrac{f(x) - f(2)}{x - 2} = ?$

A) 3 B) 2 C) 0 D) –2 E) –3

3. $f(x) = 6x^2 + 2$

$\Rightarrow \lim\limits_{x \to 3} \dfrac{f(x) - f(3)}{x - 3} = ?$

A) 36 B) 24 C) 20 D) 12 E) 6

4. $f(x) = x^3 - 2x^2 - 4$

$\Rightarrow \lim\limits_{x \to 2} \dfrac{f(x) - f(2)}{x - 2} = ?$

A) –2 B) 1 C) 3 D) 4 E) 6

5. $f(x) = 2x - 4$

$\Rightarrow \lim\limits_{h \to 0} \dfrac{f(h + 2) - f(2)}{h} = ?$

A) 1 B) 2 C) 3 D) 4 E) 8

6. $f(x) = 6x^2 - 2x$

$\Rightarrow \lim\limits_{h \to 0} \dfrac{f(h + 2) - f(2)}{h} = ?$

A) 12 B) 14 C) 16 D) 22 E) 24

7. $f(x) = 2x^2 - 4x - 15$

$\Rightarrow \lim\limits_{h \to 0} \dfrac{f(h + 1) - f(1)}{h} = ?$

A) 0 B) 4 C) 8 D) 10 E) 12

8. $f(x) = 5x^2 + 2x + 1$

$\Rightarrow \lim\limits_{h \to 0} \dfrac{f(h + 3) - f(3)}{h} = ?$

A) 6 B) 12 C) 18 D) 24 E) 32

9. $f(x) = x^2 - 4x + 3$

$\Rightarrow \lim\limits_{x \to 2} \dfrac{f(x) - f(2)}{x^2 + x - 6} = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

10. $f(2x + 1) = 4x^2 + 4x$

$\Rightarrow \lim\limits_{x \to 3} \dfrac{f(x) - f(3)}{x^2 - 9} = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

11. $f(x) = x^3 + 3x^2 + 3x + 1$

$\Rightarrow \lim\limits_{x \to -2} \dfrac{f^2(x) - f^2(-2)}{x + 2} = ?$

A) – 6 B) – 3 C) 1 D) 3 E) 6

12. $f(7x^2 - 12) = x - 2$

$\Rightarrow \lim\limits_{x \to -1} \dfrac{f^{-1}(x) - f^{-1}(-1)}{x + 1} = ?$

A) 10 B) 13 C) 14 D) 16 E) 17

13. $f(x + 5) = 2 \cdot x \cdot a + 4$

$\lim\limits_{x \to 8} \dfrac{f(x) - f(8)}{x - 8} = 16$

$\Rightarrow a = ?$

A) 2 B) 4 C) 8 D) 16 E) 32

14. $f'(2) = 4$

$\Rightarrow \lim\limits_{h \to 0} \dfrac{f(2h + 2) - f(2 - 2h)}{h} = ?$

A) 4 B) 6 C) 8 D) 12 E) 16

15. $f'(3) = 11$

$\Rightarrow \lim\limits_{h \to 0} \dfrac{f(3 - h) - f(3 - 2h)}{h} = ?$

A) 1 B) 11 C) 22 D) 33 E) 44

16. $f(x) = 4x^2 - 6x$

$\Rightarrow \lim\limits_{h \to 0} \dfrac{f(1 + 3h) - f(1 - 5h)}{h} = ?$

A) 2 B) 10 C) 16 D) 20 E) 24

1. $\lim\limits_{x \to -2} \dfrac{x^2 - 4}{x + 2} = ?$

A) -4 B) -2 C) 0 D) 2 E) 4

2. $\lim\limits_{x \to -2} \dfrac{x^2 - x - 6}{x^2 + 2x} = ?$

A) $-\dfrac{1}{2}$ B) $\dfrac{1}{2}$ C) $\dfrac{2}{3}$ D) 1 E) $\dfrac{5}{2}$

3. $\lim\limits_{x \to 1} \dfrac{x^2 - 1}{x - 1} = ?$

A) 0 B) $\dfrac{1}{2}$ C) 1 D) 2 E) ∞

4. $\lim\limits_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1} = ?$

A) -2 B) $\dfrac{1}{3}$ C) $\dfrac{1}{2}$ D) 1 E) 2

5. $\lim\limits_{x \to 8} \dfrac{\sqrt[3]{x} - 2}{x - 8} = ?$

A) $\dfrac{1}{24}$ B) $\dfrac{1}{12}$ C) $\dfrac{1}{4}$ D) $\dfrac{1}{3}$ E) $\dfrac{1}{2}$

6. $\lim\limits_{x \to 3} \dfrac{\sqrt{2x + 3} - 3}{x^2 - 9} = ?$

A) $\dfrac{1}{18}$ B) $\dfrac{1}{12}$ C) $\dfrac{1}{8}$ D) $\dfrac{1}{6}$ E) $\dfrac{1}{4}$

7. $\lim\limits_{x \to 0} \dfrac{4^x - 2^x}{x^2 - x} = ?$

A) $-\ln 4$ B) $-\ln 2$ C) 1 D) $\ln 2$ E) $\ln 4$

8. $\lim\limits_{x \to 0} \dfrac{1 - \cos x}{\sin x} = ?$

A) ∞ B) $\dfrac{\pi}{2}$ C) 1 D) $\dfrac{1}{2}$ E) 0

9. $\lim\limits_{x \to \pi} \dfrac{\sin(5x)}{\pi - x} = ?$

A) -5 B) $-\frac{1}{5}$ C) 1 D) $\frac{1}{5}$ E) 5

10. $\lim\limits_{x \to \frac{\pi}{6}} \dfrac{2\sin(5x) - 1}{\cos(2x) - \frac{1}{2}} = ?$

A) -5 B) $-\frac{5}{2}$ C) 1 D) $\frac{5}{2}$ E) 5

11. $\lim\limits_{x \to 0} \dfrac{e^{2x} - e^{-2x}}{2x} = ?$

A) $\frac{1}{4}$ B) 1 C) 2 D) 4 E) 8

12. $\lim\limits_{x \to \infty} \dfrac{e^{2x}}{x^3} = ?$

A) 0 B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) 2 E) ∞

13. $\lim\limits_{x \to 0} \dfrac{2x + \sin(2x)}{\sin(3x)} = ?$

A) 4 B) 3 C) $\frac{4}{3}$ D) $\frac{2}{3}$ E) $\frac{1}{2}$

14. $\lim\limits_{x \to 1} \dfrac{2 + 2\cos(\pi x)}{x - 1} = ?$

A) $-\pi$ B) $-\frac{\pi}{2}$ C) 0 D) $\frac{\pi}{2}$ E) π

15. $\lim\limits_{x \to 0} \dfrac{2x - 2\sin x}{e^x - 1} = ?$

A) 0 B) $\frac{1}{2}$ C) 1 D) $\frac{1}{e}$ E) e

16. $\lim\limits_{x \to \frac{\pi}{2}} \dfrac{\cos(2x) + 1}{2x - \pi} = ?$

A) -1 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 1

1. $\lim\limits_{x \to \pi^-} \dfrac{\cot\left(\frac{x}{2}\right)}{1-\sin\left(\frac{x}{2}\right)} = ?$

A) ∞ B) 2 C) 1 D) 0 E) $-\infty$

2. $\lim\limits_{x \to \pi^+} \dfrac{e^{\pi^2}-e^{x^2}}{1-\cos(2x)} = ?$

A) $-\infty$ B) -1 C) $\frac{1}{2}$ D) 1 E) ∞

3. $\lim\limits_{x \to \pi} \dfrac{\sqrt{1-\sin(2x)}-1}{\tan(2x)} = ?$

A) $-\frac{1}{4}$ B) $-\frac{1}{2}$ D) 1 E) $\frac{1}{2}$ E) 2

4. $\lim\limits_{x \to 1} \dfrac{x^3-2x+\ln x+1}{2x^3-3x+1} = ?$

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) 1 D) 2 E) 6

5. $\lim\limits_{x \to 0} \dfrac{\tan(2x)}{\ln(x+1)} = ?$

A) 4 B) 2 C) 1 D) $\frac{1}{2}$ E) 0

6. $0 \le x < \pi$

$\lim\limits_{x \to 0} \dfrac{\arcsin(2x)}{2x} = ?$

A) 4 B) 2 C) 1 D) $\frac{1}{2}$ E) $\frac{1}{4}$

7. $\lim\limits_{x \to 1^-} \dfrac{\arccos x}{\arctan(x-1)} = ?$

A) $-\infty$ B) $-\frac{1}{2}$ C) 0 D) 1 E) ∞

8. $\lim\limits_{x \to 0} \dfrac{\arctan(3x)}{1-e^{3x}} = ?$

A) -1 B) 0 C) 1 D) 3 E) 9

9. $\lim\limits_{x \to a} \dfrac{\sin(2x) - \sin(2a)}{x - a} = ?$

A) $2\cos(2a)$ B) $\cos(2a)$ C) 1 D) $2\cos(2x)$ E) $\cos(2x)$

10. $\lim\limits_{x \to y} \dfrac{x^3 - y^3}{x^4 - y^4} = ?$

A) $-\dfrac{3}{4y}$ B) 0 C) $\dfrac{3}{4}$ D) $\dfrac{3}{4y}$ E) $\dfrac{4}{3}$

11. $\lim\limits_{x \to 2} \left(\dfrac{1}{x-2} - \dfrac{4}{x^2-4}\right) = ?$

A) $\dfrac{1}{2}$ B) $\dfrac{1}{3}$ C) $\dfrac{1}{4}$ D) $-\dfrac{1}{2}$ E) $-\dfrac{1}{4}$

12. $\lim\limits_{x \to 0} \left(\dfrac{1}{\sin^2 x} - \dfrac{1}{1-\cos x}\right) = ?$

A) $-\infty$ B) $\dfrac{1}{2}$ C) 1 D) $\dfrac{3}{2}$ E) ∞

13. $\lim\limits_{x \to \infty} \left(2x \cdot \sin\left(\dfrac{1}{x}\right)\right) = ?$

A) -1 B) 0 C) $\dfrac{1}{2}$ D) 1 E) 2

14. $\lim\limits_{x \to \infty} \left(3x \cdot \tan\left(\dfrac{2}{x}\right)\right) = ?$

A) 6 B) 3 C) 2 D) $\dfrac{3}{2}$ E) 1

15. $f: R \to R$

$f'(2) = 3$

$\lim\limits_{h \to 0} \dfrac{f(2+2h) - f(2-3h)}{h} = ?$

A) 3 B) 6 C) 9 D) 12 E) 15

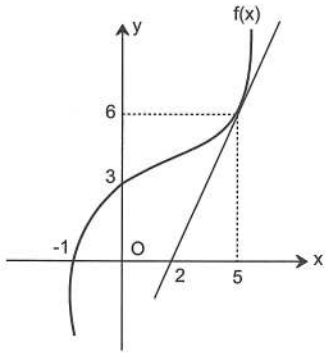
16. $f: R \to R$

$f(x) = x^2 + 3x$

$\lim\limits_{h \to 0} \dfrac{f(1+3h) - f(1-h)}{2h} = ?$

A) 10 B) 12 C) 15 D) 18 E) 20

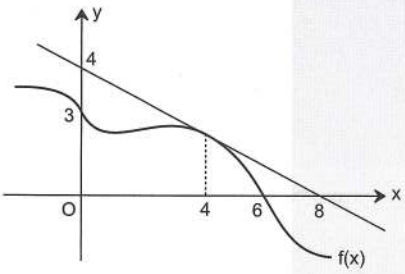
1.



$\Rightarrow f'(5) = ?$

A) 1 B) 2 C) $\frac{5}{2}$ D) 3 E) $\frac{7}{2}$

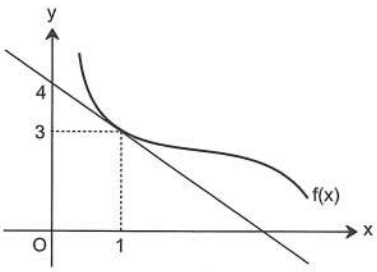
2.



$\Rightarrow f'(4) = ?$

A) –2 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 1 E) 2

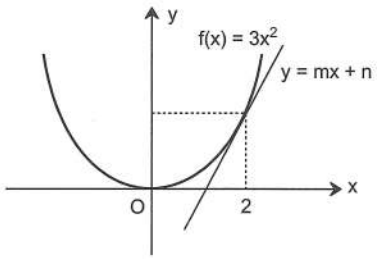
3.



$\Rightarrow f(1) \cdot f'(1) = ?$

A) 3 B) 0 C) – 1 D) – 2 E) – 3

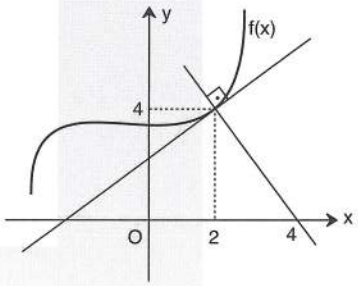
4.



$\Rightarrow y = ?$

A) 24x + 36 B) 24x –12 C) 12x – 12 D) 12x + 4 E) 8x – 4

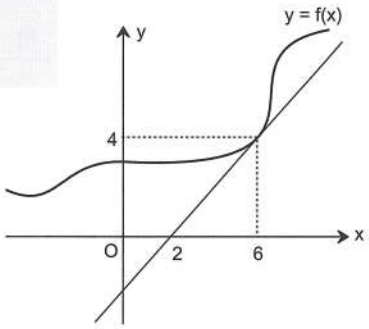
5.



$\Rightarrow f'(2) = ?$

A) – 2 B) $-\frac{1}{2}$ C) 1 D) $\frac{1}{2}$ E) 2

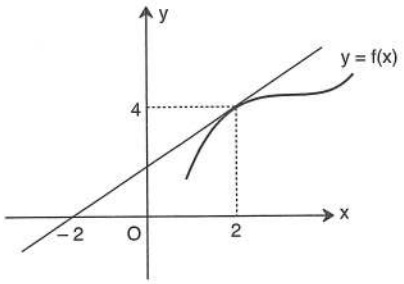
6.



$\Rightarrow \lim\limits_{x \to 6} \frac{f(x) - f(6)}{x - 6} = ?$

A) $\frac{1}{3}$ B) 1 C) $\frac{3}{2}$ D) 2 E) 4

7.

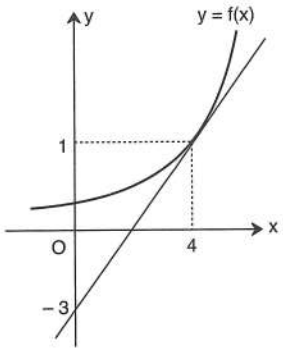


$g(x) = x^2 \cdot f(x) + 2$

$\Rightarrow g'(2) = ?$

A) 12 B) 16 C) 20 D) 22 E) 24

8.

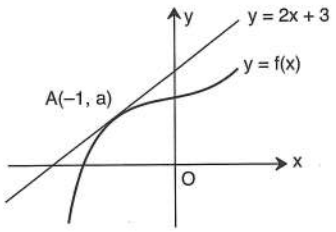


$h(x) = \dfrac{f(x)}{x}$

$\Rightarrow h'(4) = ?$

A) $\frac{3}{16}$ B) $\frac{1}{4}$ C) $\frac{1}{3}$ D) $-\frac{2}{3}$ E) $-\frac{1}{4}$

9.

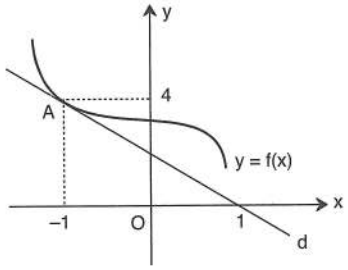


$h(x) = f(x) \cdot x$

$\Rightarrow h'(-1) = ?$

A) –3 B) –1 C) 3 D) 4 E) 6

10.

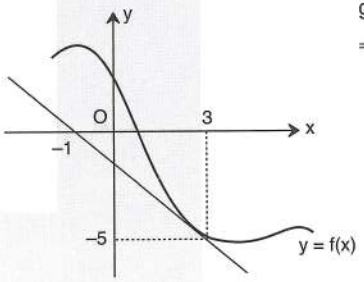


$h(x) = (x^2 + 1) \cdot f(x)$

$\Rightarrow h'(-1) = ?$

A) –18 B) –16 C) –12 D) –8 E) 2

11.

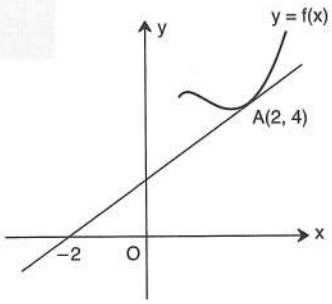


$g(x) = f(x) \cdot x^2$

$\Rightarrow g'(3) = ?$

A) $-\frac{165}{4}$ B) $-\frac{105}{4}$ C) $-\frac{95}{4}$ D) $-\frac{55}{4}$ E) $-\frac{25}{4}$

12.



$g(x) = (x^2 - 2) \cdot f(x) + x$

$\Rightarrow g'(2) = ?$

A) 27 B) 24 C) 19 D) 17 E) 15

1. $f(x)=\begin{cases} x^2-1 & x\geq 1 \\ 6x+2 & x<1 \end{cases}$

$\Rightarrow f'(2)+f'(-1)=?$

A) 16 B) 10 C) 8 D) 4 E) 2

2. $f(x)=\begin{cases} 3x^2-1 & x\geq 2 \\ x^2+4x & x<2 \end{cases}$

$\Rightarrow f'(2^-)+f'(2^+)=?$

A) 20 B) 18 C) 16 D) 12 E) 8

3. $f(x)=\begin{cases} x^3+1 & x>1 \\ 2 & x=1 \\ 3x-1 & x<1 \end{cases}$

$\Rightarrow f'(1)=?$

A) 0 B) 1 C) 2 D) 3 E) Ø

4. $f(x)=\begin{cases} 2x-1 & x<3 \\ x^2-4x+8 & x\geq 3 \end{cases}$

$\Rightarrow f'(3)=?$

A) 0 B) 1 C) 2 D) 8 E) Ø

5. $f(x)=\begin{cases} \ln(x+3) & x\geq -2 \\ x+2 & x<-2 \end{cases}$

$\Rightarrow f'(-2)=?$

A) 0 B) 1 C) 2 D) 3 E) Ø

6. $k\in R$,

$f(x)=\begin{cases} ax-bx^2 & x\geq 1 \\ 2x^3-1 & x<1 \end{cases}$

$f'(1)=k$

$\Rightarrow b=?$

A) -5 B) -4 C) -2 D) 1 E) 2

7. $f(x)=\begin{cases} x^2-1 & x\geq 2 \\ x+2 & x<2 \end{cases}$

$\Rightarrow f'(1)+f'(3)=?$

A) 8 B) 7 C) 6 D) 5 E) 4

8. $f(x)=\begin{cases} x^3+2x & x>1 \\ x^2-4x & x\leq 1 \end{cases}$

$\Rightarrow f'(3)+2\cdot f'(-1)=?$

A) 17 B) 15 C) 13 D) 12 E) 9

9. $f(x) = \begin{cases} |x^2-4| & x > 3 \\ |2x-6| & x \le 3 \end{cases}$

$\Rightarrow f'(2) + f'(4) = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

10. $f(x) = \begin{cases} |3x-6| + x^2 & x < 2 \\ |x^2-1| + 3 & x \ge 2 \end{cases}$

$\Rightarrow f'(2) + f'(1) = ?$

A) 5 B) 4 C) 3 D) 2 E) Ø

11. $g(x) = 5 - x$

$f(x) = \begin{cases} x+1 & x \ge 1 \\ 2x-3 & x < 1 \end{cases}$

$\Rightarrow (fog)'(3) = ?$

A) – 2 B) – 1 C) 2 D) 8 E) 12

12. $f(x) = \begin{cases} |x^2-2x+1| & x > 1 \\ |x^2-1| & x \le 1 \end{cases}$

$\Rightarrow f'(1) - f'(-1) = ?$

A) – 3 B) –2 C) –1 D) 2 E) Ø

13. $f(x) = \begin{cases} x^2+1 & x < 5 \\ x^3-2x & x \ge 5 \end{cases}$

$\Rightarrow f'(5) - f'(4) = ?$

A) 60 B) 62 C) 65 D) 70 E) Ø

14. $f(x) = x^2 + 1$

$g(x) = \begin{cases} x^2+1 & x > 1 \\ 3x-4 & x \le 1 \end{cases}$

$\Rightarrow (gof)'(2) = ?$

A) 8 B) 12 C) 20 D) 32 E) 40

15. $f(x) = |x+3|$

$\Rightarrow f'(-3^+) = ?$

A) –2 B) –1 C) 1 D) 2 E) Ø

16. $a \in R$,

$f(x) = \begin{cases} x+2 & x > 1 \\ a & x = 1 \\ x^2+2x & x < 1 \end{cases}$

$\lim\limits_{x \to 1} f(x) = a$

$\Rightarrow f'(a) = ?$

A) 0 B) 1 C) 2 D) 6 E) 8

1. $f(x) = |x^2 - 4|$
$\Rightarrow f'(3) = ?$

A) -6 B) -3 C) 0 D) 3 E) 6

2. $f(x) = |x^2 - 2x| + |3x - 6|$
$\Rightarrow f'(3) = ?$

A) -6 B) -3 C) 3 D) 6 E) 7

3. $f(x) = \dfrac{|x^2 - 3x - 4|}{|x + 1|}$

$\Rightarrow f'(2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

4. $f(x) = 4 \cdot x \cdot |x^2 - 1|$
$\Rightarrow f'(3) = ?$

A) 104 B) 96 C) 32 D) 0 E) -16

5. $f(x) = \dfrac{x^3 + 2x}{|x^2 - 4|}$

$\Rightarrow f'(1) = ?$

A) $\dfrac{7}{3}$ B) 1 C) $\dfrac{1}{3}$ D) 0 E) -1

6. $f(x) = |x^2 + 2x| - 1$
$\Rightarrow f'(3) + f'(-3) = ?$

A) 16 B) 12 C) 10 D) 8 E) 4

7. $f(x) = 3^{|x^2 - 4x|}$
$\Rightarrow f'(1) = ?$

A) $27 \cdot \ln 2$ B) $9 \cdot \ln 3$ C) $54 \cdot \ln 2$ D) $54 \cdot \ln 3$ E) $9 \cdot \ln 3$

8. $f(x) = |x^2 - 1| \cdot |x^3 + 1|$
$\Rightarrow f'(-2) = ?$

A) -36 B) -40 C) -48 D) -64 E) -72

9. $f(x) = |x-2| + x^3$
$\Rightarrow f'(2) = ?$

A) 14 B) 13 C) 11 D) 9 E) Ø

10. $f(x) = |x^2 - 4|$
$\Rightarrow f'(2^-) + f'(2^+) = ?$

A) –4 B) –1 C) 0 D) 1 E) 4

11. $f(x) = |x^2 - 2x - 35| + x$
$\Rightarrow f'(3) = ?$

A) – 3 B) – 2 C) – 1 D) 2 E) 3

12. $f(x) = \left|\dfrac{x^3 - \pi}{3}\right|$
$\Rightarrow f'(e) = ?$

A) e^2 B) e C) $\dfrac{e}{2}$ D) $\pi - e$ E) $e - \pi$

13. $f(x) = x \cdot |x-2| - 3x - 2$
$\Rightarrow f'(3) = ?$

A) –1 B) 1 C) 2 D) 3 E) 5

14. $f(x) = (x^3 - 1) \cdot |x^2 - 9| + 2x - 1$
$\Rightarrow f'(3) = ?$

A) –6 B) 12 C) 22 D) 24 E) Ø

15. $f(x) = |\sin(2x)| + |1 + \ln(x^2)|$
$\Rightarrow f'(0^+) = ?$

A) $-\infty$ B) –2 C) 1 D) 2 E) ∞

16. $f(x) = |x^5 + x^4| + x^3 \cdot |x|$
$\Rightarrow f'(0) = ?$

A) –1 B) 0 C) 1 D) 2 E) Ø

1. $f(x) = x^3 \cdot \text{sgn}(x-4)$
$\Rightarrow f'(3) = ?$

A) -27 B) -9 C) 3 D) 9 E) 27

2. $f(x) = x^2 + x \cdot \text{sgn}(x+1)$
$\Rightarrow f'(1) = ?$

A) 4 B) 3 C) 2 D) 1 E) 0

3. $f(x) = \dfrac{x^2}{\text{sgn}\left(\frac{x}{4}\right)}$
$\Rightarrow f'(6) = ?$

A) 12 B) 4 C) 2 D) 1 E) $\frac{1}{2}$

4. $f(x) = \dfrac{x}{\text{sgn}x} + \dfrac{\text{sgn}(x-3)}{x-3}$
$\Rightarrow f'(2) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

5. $f(x) = 4 \cdot x \cdot \text{sgn}(x^2) + x^2 \cdot \text{sgn}(x)$
$\Rightarrow f'(-1) = ?$

A) 6 B) 5 C) 4 D) 3 E) 2

6. $f(x) = \dfrac{x}{\text{sgn}(x-1)}$
$\Rightarrow f'(-3) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

7. $f(x) = [\![x^3 - 8]\!]$
$\Rightarrow f'\left(\frac{1}{2}\right) = ?$

A) -8 B) -4 C) 0 D) $\frac{3}{4}$ E) 3

8. $f(x) = \dfrac{x^3 - x}{[\![2x]\!]}$
$\Rightarrow f'\left(\frac{2}{3}\right) = ?$

A) 0 B) $\frac{1}{4}$ C) $\frac{1}{3}$ D) $\frac{4}{3}$ E) 2

9. $f(x) = x \cdot \sin\left(\frac{x}{4}\right) \cdot \left[\!\left[\frac{x}{2}\right]\!\right]$

$\Rightarrow f'(\pi) = ?$

A) $-\frac{\sqrt{2}}{2}(2+\pi)$ B) $\frac{\pi+\sqrt{2}}{2}$ C) 0 D) $\frac{\sqrt{2}}{2}(4+\pi)$ E) $\frac{\sqrt{2}}{2}\left(1+\frac{\pi}{4}\right)$

10. $f(x) = x^2 + [\![x]\!] - \text{sgn}(x^2 - 4x + 4)$

$\Rightarrow f'\left(-\frac{1}{2}\right) = ?$

A) –2 B) –1 C) 0 D) 1 E) 2

11. $f(x) = [\![x \cdot \text{sgn}(x)]\!] \cdot x^2$

$\Rightarrow f'\left(\frac{5}{2}\right) = ?$

A) 20 B) 15 C) 10 D) 5 E) 0

12. $f(x) = [\![\text{sgn}(2 - x) + x]\!]$

$f'(3) = ?$

A) Ø B) –3 C) –2 D) –1 E) 0

13. $f(x) = x^2\left[\!\left[\frac{x}{3}\right]\!\right] + x^2\left[\!\left[\frac{x}{2}\right]\!\right]$

$\Rightarrow f'(4) = ?$

A) 24 B) 18 C) 16 D) 14 E) Ø

14. $f(x) = \frac{4x-1}{[\![x]\!]+4}$

$\Rightarrow f'\left(\frac{1}{2}\right) = ?$

A) –2 B) –1 C) 1 D) 2 E) 4

15. $f(x) = \frac{3x+6}{\left[\!\left[\text{sgn}(x^2+2x)\right]\!\right] + x}$

$\Rightarrow f'(1) = ?$

A) $-\frac{3}{4}$ B) 1 C) $\frac{5}{4}$ D) $\frac{3}{2}$ E) 2

16. $f(x) = x^2[\![x+2]\!] - 2x + \text{sgn}(x+1)$

$\Rightarrow f'\left(\frac{3}{2}\right) = ?$

A) 11 B) 10 C) 7 D) 5 E) 3

1. $f(x) = \text{sgn}(x^5 - 5) \cdot |x^2 - 1|$
$\Rightarrow f'(3) = ?$

A) 36 B) 18 C) 15 D) 12 E) 6

2. $f(x) = \dfrac{x^2 + \text{sgn}(x-2)}{x^2 - |x+2|}$

$\Rightarrow f'(1) = ?$

A) – 4 B) – 2 C) – 1 D) 1 E) 2

3. $f(x) = |x^3 - 4x^2| + \text{sgn}(x + 2)$
$\Rightarrow f'(2) = ?$

A) 8 B) 4 C) 2 D) 0 E) –2

4. $f(x) = |\text{sgn}(x - 1) - x^2|$
$\Rightarrow f'(-2) = ?$

A) – 16 B) – 8 C) – 4 D) – 2 E) 0

5. $f(x) = \left[\!\left[\dfrac{x+7}{2}\right]\!\right] \cdot |x - 4| \cdot \text{sgn}(x - 5)$

$\Rightarrow f'(6) = ?$

A) 8 B) 6 C) 4 D) 2 E) 1

6. $f(x) = \text{sgn}(x - 3) \cdot x^2 + |x - 6| + \left[\!\left[\dfrac{5}{x}\right]\!\right] \cdot x$
$\Rightarrow f'(2) = ?$

A) – 5 B) – 3 C) – 2 D) – 1 E) 0

7. $f(x) = |x^2 - 2x + 5| + \text{sgn}(x^3 + 5) + \left[\!\left[\dfrac{x+5}{2}\right]\!\right]$
$\Rightarrow f'(4) = ?$

A) Ø B) 4 C) 6 D) 8 E) 10

8. $f(x) = \dfrac{|x^2 - 3x - 4|}{\left[\!\left[x + \dfrac{5}{3}\right]\!\right]}$

$\Rightarrow f'\left(-\dfrac{1}{2}\right) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

9. $f(x) = \dfrac{|x-3|}{\left[\!\left[\dfrac{5x}{2}\right]\!\right] + \operatorname{sgn}(3-x)}$

$\Rightarrow f'(1) = ?$

A) -3 B) $-\dfrac{1}{3}$ C) 0 D) $\dfrac{1}{3}$ E) 3

10. $f(x) = \begin{cases} \dfrac{x^3}{3} - 2 & x \geq 3 \\ \sqrt{x+6} + 4 & x < 3 \end{cases}$

$\Rightarrow f'(4) - f'(-2) = ?$

A) $\dfrac{63}{4}$ B) $\dfrac{97}{12}$ C) $\dfrac{95}{6}$ D) $\dfrac{45}{6}$ E) 8

11. $f(x) = \operatorname{sgn}(x^2 + 4x + 4) \cdot \left[\!\left[\dfrac{x-3}{x+2}\right]\!\right] + |x^2 - 2x|$

$\Rightarrow f'(4) = ?$

A) 12 B) 10 C) 8 D) 6 E) 4

12. $f(x) = x^4 \cdot \left[\!\left[\dfrac{x}{3} + 2\right]\!\right] + |x^2 - 4|$

$\Rightarrow f'(-1) = ?$

A) -5 B) -2 C) 2 D) 6 E) 10

13. $f: R^+ \to R$

$f(x^2 - 3) = x^3 \cdot \operatorname{sgn}(x-1)$

$\Rightarrow f'(1) = ?$

A) 4 B) 3 C) 2 D) 1 E) 0

14. $f(x) = \dfrac{|x^2 - 2| \cdot \operatorname{sgn}(x-1)}{[\![4x]\!] + x}$

$\Rightarrow f'\left(\dfrac{1}{5}\right) = ?$

A) 50 B) 51 C) 53 D) 55 E) Ø

15. $f(x) = \operatorname{sgn}(x^2 - 4) \cdot |2 - x| - x \cdot \left[\!\left[\dfrac{x-4}{2}\right]\!\right]$

$\Rightarrow f'(-1) = ?$

A) -6 B) -3 C) -2 D) 2 E) 4

16. $f(x) = x^3 \cdot [\![x]\!] + x^2 \cdot \operatorname{sgn}(x+2)$

$\Rightarrow f'\left(\dfrac{1}{2}\right) = ?$

A) -1 B) 0 C) 1 D) 2 E) Ø

1. $f(x) = x^3 - 2x + 1$
$\Rightarrow f'(2) = ?$

A) 12 B) 10 C) 8 D) 6 E) 4

2. $f(x) = \dfrac{3x-1}{x^2-1}$
$\Rightarrow f'(2) = ?$

A) $-\dfrac{11}{9}$ B) $\dfrac{17}{3}$ C) 6 D) 7 E) $\dfrac{29}{3}$

3. $f(x) = \sqrt{x^2 - 3x}$
$\Rightarrow f'(4) = ?$

A) $\dfrac{5}{4}$ B) $\dfrac{9}{4}$ C) 1 D) 4 E) $6\sqrt{2}$

4. $f(x) = \dfrac{x^2-2}{2x+1}$
$\Rightarrow f'(x) = ?$

A) $\dfrac{2x^2+2x+4}{(2x+1)^2}$ B) $\dfrac{2x+4}{(2x+1)^2}$ C) $\dfrac{6x^2+2x-4}{(2x+1)^2}$ D) $\dfrac{1}{(2x+1)^2}$ E) $\dfrac{x}{(2x+1)^2}$

5. $f(x^3 + 1) = x^2 - 4x$
$\Rightarrow f'(9) = ?$

A) $-\dfrac{1}{4}$ B) 0 C) $\dfrac{1}{4}$ D) 1 E) 2

6. $f(x) = \dfrac{x}{x-1}$
$\Rightarrow f'(x) = ?$

A) $\dfrac{1}{x-1}$ B) $\dfrac{1}{(x-1)^2}$ C) $-\dfrac{1}{(x-1)^2}$ D) $\dfrac{1}{1-x}$ E) $\dfrac{x}{(x-1)^2}$

7. $f(x) = (5x^2 - 2) \cdot (x^4 + 4)$
$\Rightarrow f'(-1) = ?$

A) -62 B) -50 C) -20 D) -18 E) 0

8. $f(x) = \sqrt[3]{x^4 - 4x^3 + 4x^2}$
$\Rightarrow f'(x) = ?$

A) $\dfrac{2x-2}{\sqrt[3]{x^2-2x}}$ B) $\dfrac{8x-4}{3\sqrt[3]{x^2-2x}}$ C) $\dfrac{4x-4}{\sqrt[3]{x^2-2x}}$ D) $\dfrac{4x-4}{3\sqrt[3]{x^2-2x}}$ E) $\dfrac{x-1}{3\sqrt[3]{x^2-2x}}$

9. $f(x) = (3 + x) \cdot (2 - x) \cdot (9 + x^2)$
$\Rightarrow f'(2) = ?$

A) -65 B) -20 C) -5 D) 20 E) 65

10. $f(x^3 - 2x) = \frac{x^3}{3} - 2x^2$
$\Rightarrow f'(1) = ?$

A) -5 B) -1 C) -3 D) 5 E) 7

11. $f(x) = \frac{x^3 - 2x}{x^2 - 3x + 1}$
$\Rightarrow f'(1) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

12. $f(x) = 2\sin x - 3\cos^2(2x)$
$\Rightarrow f'\left(\frac{\pi}{2}\right) = ?$

A) $-\sqrt{3}$ B) $-\frac{\sqrt{3}}{2}$ C) 0 D) $\frac{1}{2}$ E) $\frac{\sqrt{3}}{2}$

13. $x \in R^+$
$f(x^2 - 1) = x^3 - 2x + 4$
$\Rightarrow f'(3) = ?$

A) $\frac{5}{3}$ B) $\frac{5}{2}$ C) 3 D) 4 E) $\frac{11}{2}$

14. $f(x) = \arccos(3x)$
$\Rightarrow f'\left(\frac{1}{5}\right) = ?$

A) $-\frac{15}{4}$ B) $-\frac{5}{2}$ C) -1 D) 0 E) 1

15. $f(x) = \sqrt[3]{x^2\sqrt{x}}$
$\Rightarrow f'(64) = ?$

A) $\frac{5}{3}$ B) $\frac{5}{12}$ C) $\frac{5}{6}$ D) $\frac{1}{2}$ E) $\frac{1}{4}$

16. $f(x) = \log_2(\sin(4x))$
$\Rightarrow f'(x) = ?$

A) $\frac{\cot(4x)}{\ln 2}$ B) $\cot(4x) \cdot \log_2 e^4$
C) $\frac{4\tan(4x)}{\ln 2}$ D) $\tan(4x) \cdot \ln 16$
E) $\tan(4x) \cdot \ln 2$

1. $f(x) = (x^2+9)\cdot\sqrt{x^2+9}$

$\Rightarrow f'(4) = ?$

A) 8 B) 12 C) 24 D) 48 E) 60

2. $F(x, y) = x^2 + y^2 - 2x - y - 5 = 0$

$\Rightarrow F'(1, -2) = ?$

A) -5 B) -3 C) -2 D) -1 E) 0

3. $f(x) = |x^2 - 4| + 2x$

$\Rightarrow f'(1) = ?$

A) -1 B) 0 C) 1 D) 2 E) 4

4. $f(2x) - f(4x^2 - 2x) = 4x^2 - 2x$

$\Rightarrow f'(2) = ?$

A) $-\frac{5}{2}$ B) $-\frac{3}{2}$ C) $-\frac{7}{6}$ D) $\frac{5}{2}$ E) 4

5. $f(x) = \begin{cases} 6x+1 & x > 1 \\ 3x^2+4 & x \le 1 \end{cases}$

$\Rightarrow f'(1) = ?$

A) 2 B) 4 C) 6 D) 8 E) Ø

6. $f(x) = (1-x)^2\cdot(1+x)^2\cdot(2-x)^2$

$\Rightarrow f'(1) = ?$

A) -2 B) -1 C) 0 D) 2 E) 4

7. $f(x) = 3^x + x^3 + e^x$

$\Rightarrow f'(0) = ?$

A) 1 B) e C) ln3 D) ln3 + 1 E) ln3 − 1

8. $f(x) = x^2\cdot g(2x-1)$

$f'(2) = 4$

$g(3) = 1$

$\Rightarrow g'(3) = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

9. $x = \cos t$

$y = \sin t$

$\Rightarrow \left.\dfrac{d^2y}{dx^2}\right|_{t=\frac{\pi}{2}} = ?$

A) -2 B) -1 C) 0 D) 1 E) 2

10. $x > 0$

$y = \ln\sqrt{t}$

$t = v - 1$

$v = x^2 + 1$

$\Rightarrow \dfrac{dy}{dx} = ?$

A) $\dfrac{2}{x}$ B) $\dfrac{1}{x}$ C) 1 D) x E) $2x$

11. $a, b \in R$

$a \cdot b = 6$

$\Rightarrow \min(2a + 3b) = ?$

A) -20 B) -18 C) -12 D) -9 E) -3

12. $f(x) = 2e^{2x}$

$\Rightarrow \dfrac{d^2f(x)}{dx^2} = ?$

A) $2f(x)$ B) $4f(x)$ C) $6f(x)$ D) $8f(x)$ E) $16f(x)$

13. $0 \le x < \dfrac{\pi}{2}$

$f(x) = \arccos(\sin x)$

$\Rightarrow f'(0)$?

A) -1 B) $-\dfrac{1}{2}$ C) 0 D) $\dfrac{1}{2}$ E) 1

14. $f(x) = 4^{\tan(2x)}$

$\Rightarrow f'\left(\dfrac{\pi}{8}\right) = ?$

A) $32 \cdot \ln 2$ B) $8\sqrt{3} \cdot \ln 2$ C) $\dfrac{16}{\ln 2}$ D) $\dfrac{8\sqrt{3}}{\ln 2}$ E) $16 \cdot \log 2$

15. $f(x) = e^x \cdot x^e$

$\Rightarrow f'(1) = ?$

A) $e + 1$ B) $e^2 + e$ C) 1 D) $e - 1$ E) $e^3 + e^2$

16. $y = 2^t$

$t = \cos u$

$u = \ln x$

$\Rightarrow \left.\dfrac{dy}{dx}\right|_{x=1} = ?$

A) $-\ln 2$ B) 0 C) $\ln 2$ D) 4 E) $2 \cdot \ln 2$

1. $f(x) = \begin{cases} 3x+1 & x \geq 2 \\ 2x^2-1 & x < 2 \end{cases}$

$\Rightarrow f'(2) = ?$

A) 8 B) 4 C) 3 D) 2 E) Ø

2. $f: R \to R$

$f(x) = x^2 - 6x - 7$

$\Rightarrow \min(f(x)) = ?$

A) –18 B) –16 C) –12 D) –10 E) –2

3. $y = t + 1$

$t = 4u - 1$

$u = 3x^2 + 1$

$\Rightarrow \dfrac{dy}{dx} = ?$

A) 8 B) 12 C) 8x D) 12x E) 24x

4. $f(x) = \arctan(\ln|2x|)$

$\Rightarrow f'\left(\dfrac{e}{2}\right) = ?$

A) $\dfrac{1}{e}$ B) $\dfrac{1}{2e}$ C) 2e D) $\dfrac{2}{e}$ E) $\dfrac{4}{e}$

5. $f: R^+ \to R^+$

$f(x) = e^{x^2-3}$

$\Rightarrow (f^{-1})'(e) = ?$

A) 1 B) $\dfrac{1}{e}$ C) $\dfrac{1}{2e}$ D) $\dfrac{1}{2}$ E) $\dfrac{1}{4e}$

6. $y = 2^{\ln\sqrt{a}}$

$a = x^2$

$\Rightarrow \dfrac{dy}{dx} = ?$

A) $\dfrac{2^{\ln x} \cdot \ln 2}{x}$ B) $\dfrac{2^{\ln x} \cdot \ln 2}{2}$

C) $\ln 2 \cdot 2^{\ln x}$ D) $\ln(2x) \cdot 2^{\ln x}$

E) $2 \cdot \ln 2^x$

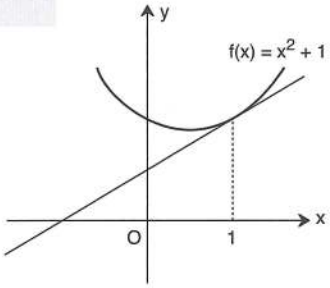
7. $f(x) = \sin x$

$\Rightarrow \dfrac{d^{2002} f(x)}{dx^{2002}} = ?$

A) – cosx B) sinx C) cosx

D) – sinx E) 2002 · sinx

8.



$\Rightarrow \lim\limits_{x \to 1} \dfrac{f(x) - x \cdot f(1)}{x - 1} = ?$

A) – 3 B) – 2 C) 0 D) 3 E) 5

9. $f(x) = x^{2x}$
$\Rightarrow f'(1) = ?$

A) -1 B) 0 C) 1 D) 2 E) 3

10. $f(x) = \ln(\ln(2^x))$
$\Rightarrow f'(1) = ?$

A) -1 B) 0 C) 1 D) 2 E) ln2

11. $\frac{d^5}{dx^5}(\sin^2 x) = ?$

A) $16 \cdot \sin(2x)$ B) $-16 \cdot \sin(2x)$
C) $32 \cdot \cos(2x)$ D) $-16 \cdot \cos(2x)$
E) $-8 \cdot \sin(2x)$

12. $\lim\limits_{x \to 0} \frac{x - \sin(x^2)}{x \cdot \cos x} = ?$

A) -2 B) -1 C) 1 D) 2 E) 3

13. $y = 3^{\sin\frac{x}{8}}$

$\Rightarrow \left.\frac{dy}{dx}\right|_{x=4\pi} = ?$

A) -2 B) $-\frac{1}{2}$ C) 0 D) $\frac{1}{2}$ E) 2

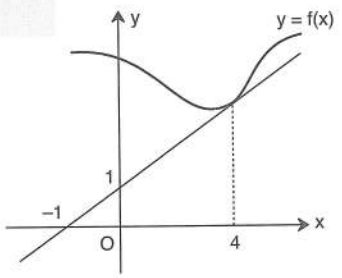
14. $y = t^2 - 3t$
$x = t^2 + 2$
$\Rightarrow \left.\frac{d^2y}{dx^2}\right|_{t=1} = ?$

A) -2 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) $\frac{3}{4}$ D) 2

15. $f(x) = x^{(e^x)}$
$\Rightarrow f'(1) = ?$

A) -2 B) $-e$ C) 0 D) e E) 2

16.



$g(x) = x^2 + x \cdot f(x)$
$\Rightarrow g'(4) = ?$

A) 14 B) 16 C) 17 D) 18 E) 19

1. $x = e^t$

$y = \ln t$

$\Rightarrow \left.\dfrac{d^2y}{dx^2}\right|_{y=0} = ?$

A) e^2 B) e C) $-\dfrac{1}{e}$ D) $\dfrac{1}{e}$ E) $-\dfrac{2}{e^2}$

2. $f(x) = \ln(\arctan x)$

$\Rightarrow f'(x) = ?$

A) $\dfrac{\arctan x}{1+x}$ B) $\dfrac{(\arctan x)^{-1}}{1+x^2}$

C) $\dfrac{\operatorname{arccot} x}{1+x^2}$ D) $\dfrac{(\operatorname{arccot} x)^{-1}}{1+x^2}$

E) $\dfrac{\arctan x}{1-x^2}$

3. $f: R \to R$

$f(x) = -x^2 - 2x + 6$

$\Rightarrow \max(f(x)) = ?$

A) 10 B) 9 C) 8 D) 7 E) 6

4. $f: [2, \infty) \to R$

$f(x) = x^2 - 4x$

$\Rightarrow (f^{-1})'(5) = ?$

A) 1 B) $\dfrac{1}{3}$ C) $\dfrac{1}{4}$ D) $\dfrac{1}{6}$ E) $\dfrac{2}{15}$

5. $f(x) = (3x-1)^{12}$

$\Rightarrow \dfrac{d^{12}f(x)}{dx^{12}} = ?$

A) 12! B) $3 \cdot 12!$ C) $3^{12} \cdot 12!$

D) $(12!)^2$ E) $12 \cdot 3^{12}$

6. $x = \cos t$

$y = \sin t$

$\Rightarrow \left.\dfrac{dy}{dx}\right|_{t=\frac{\pi}{3}} = ?$

A) $-\sqrt{3}$ B) $-\dfrac{1}{\sqrt{3}}$ C) 0 D) $\dfrac{1}{\sqrt{3}}$ E) $\sqrt{3}$

7. $x = \sin t$

$y = \sin t - \cos t$

$\Rightarrow \left.\dfrac{d^2y}{dx^2}\right|_{t=\frac{\pi}{3}} = ?$

A) 8 B) $1+\sqrt{3}$ C) $2\sqrt{3}+1$

D) $\dfrac{4\sqrt{3}}{3}$ E) $2\sqrt{3}+2$

8. $F(x, y) = xy - 2x^2y^2 + 4x^3 + 2 = 0$

$\Rightarrow F'(1, 2) = ?$

A) $-\dfrac{2}{7}$ B) $\dfrac{2}{7}$ C) $\dfrac{1}{5}$ D) $\dfrac{1}{3}$ E) $\dfrac{1}{2}$

9. $f(x) = x - \ln x$

$\Rightarrow f'(e^{-2}) = ?$

A) -2 B) -1 C) e D) 1 E) $1 - e^2$

10. $f(x) = \tan\sqrt{x}$

$\Rightarrow f'(x) = ?$

A) $\frac{\sqrt{x}}{2}\tan\sqrt{x}$ B) $\frac{1}{2}\cdot\frac{1}{\sqrt{x}}\tan\sqrt{x}$

C) $\frac{1}{2\sqrt{x}}\sec^2\sqrt{x}$ D) $\frac{1}{2\sqrt{x}}\sec\sqrt{x}$

E) $\frac{\operatorname{cosec}\sqrt{x}}{2}$

11. $f(\ln x) = x^2 - 2x$

$\Rightarrow f'(0) = ?$

A) 2 B) 1 C) 0 D) -1 E) -2

12. $f(x) = \ln(\ln x)$

$\Rightarrow f'(e) = ?$

A) $-\frac{2}{e}$ B) $-\frac{1}{e}$ C) 1 D) $\frac{1}{e}$ E) $\frac{2}{e}$

13. $f(x) = \begin{cases} x^2 - 1 & x < 2 \\ 3 & x = 2 \\ 4x - 5 & x > 2 \end{cases}$

$\Rightarrow f'(2) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

14. $y = 2^{\ln x}$

$\Rightarrow \frac{dy}{dx} = ?$

A) $\frac{\ln x}{2x}$ B) $\frac{2\ln x}{x}$ C) $\frac{2^{\ln x}\cdot\ln 2}{x}$

D) $\ln 2 \cdot 2^{\ln x}$ E) $\ln(2x)\cdot 2^{\ln x}$

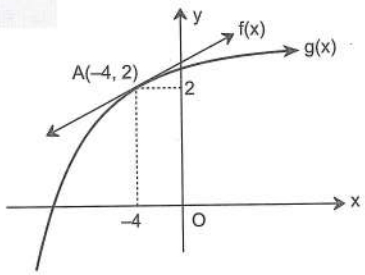
15. $y = t^3 + t^2 + 5$

$x = t^2 + t - 2$

$\Rightarrow \left.\frac{dy}{dx}\right|_{t=1} = ?$

A) $-\frac{5}{3}$ B) $-\frac{1}{2}$ C) 1 D) $\frac{3}{2}$ E) $\frac{5}{3}$

16.



$h(x) = f(x) - g(x)$

$\Rightarrow h'(-4) = ?$

A) -4 B) -2 C) 0 D) 2 E) 4

TÜREV
DERIVATIVE

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	C	B	E	E	C	D	A	B	C	C	B	A	C	A	C

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	A	C	D	A	E	C	B	D	A	C	E	B	C	A	A

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	E	B	E	D	A	B	B	B	D	A	A	B	E	B

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	C	A	E	D	C	C	B	E	D	B	C	D	D	E

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	D	B	C	A	A	D	C	D	B	B	C	B	D	D	C

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	A	E	B	E	C	C	E	D	A	C	A	A	A	C	A

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	E	A	E	C	B	C	D	E	B	D	B	D	C	A	D

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	D	C	C	E	D	B	E	B	C	C	A	B	D	C	B

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	E	A	C	A	E	B	E	E	E	A	C	A	E	C

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	C	E	A	B	B	E	B	E	E	E	E	D	D	E	C

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	E	C	C	A	C	E	A	C	C	D	A	D	B	A

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	D	B	E	B	B	C	A	D	D	E	C	E	E	B	D

TEST 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	A	D	B	D	A	E	C	A	A	C	C	E	B	C

TEST 14

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	D	C	B	A	B	E	E	E	C	E	C	C	A	C

TEST 15

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	A	B	B	B	C	A	A	A	D	C	A	E	A	E	A

TEST 16

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	B	E	C	D	B	C	A	B	C	A	C				

TEST 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	D	C	B	A	B	A	A	E	B	E	E	E	C	B

TEST 18

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	E	B	A	A	E	D	D	E	C	A	A	B	E	A	B

TEST 19

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	A	E	A	B	C	C	E	B	C	A	E	C	A	C

TEST 20

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	C	B	C	B	B	C	C	B	A	D	B	B	B	E	C

TEST 21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	A	A	B	C	A	D	A	D	A	C	B	A	B	B

TEST 22

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	E	B	B	C	C	D	C	B	B	C	B	A	A	B	B

TEST 23

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	B	E	A	E	A	D	C	D	C	A	C	C	D	D	C

TEST 24

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	B	D	D	C	B	A	A	E	C	C	D	D	C	E	C

İNTEGRAL

INTEGRAL

İNTEGRAL

TANIM | Definition

Belirsiz İntegral | Indefinite Integral

$$\frac{df(x)}{dx} = G(x)$$

$$\Rightarrow \int G(x)\,dx = f(x) + c$$

Örnek | Example

$$(x^2)' = 2x$$

$$(x^2 + 1)' = 2x$$

$$(x^2 + 3)' = 2x$$

$$(x^2 + c)' = 2x \qquad c \in R$$

$$\int (2x)\,dx = x^2 + c$$

ÖZELLİK | Property 1

- $\int x^n dx = \frac{x^{n+1}}{n+1} + c \qquad n \neq -1$
- $\int \frac{1}{x} dx = \ln|x| + c$

1. $\int x^2 dx = ?$ $\quad \frac{x^3}{3} + c$

2. $\int x^4 dx = ?$ $\quad \frac{x^5}{5} + c$

3. $\int x dx = ?$ $\quad \frac{x^2}{2} + c$

4. $\int \frac{1}{x^2} dx = ?$ $\quad -\frac{1}{x} + c$

5. $\int \sqrt{x}\,dx = ?$ $\quad \frac{2}{3}x^{\left(\frac{3}{2}\right)} + c$

6. $\int \sqrt[3]{x}\,dx = ?$ $\quad \frac{3}{4}x^{\left(\frac{4}{3}\right)} + c$

7. $\int y^{-4} dy = ?$ $\quad -\frac{1}{3} \cdot \frac{1}{y^3} + c$

8. $\int u^2 du = ?$ $\quad \frac{u^3}{3} + c$

9. $\int \sqrt{x^3}\,dx = ?$ $\quad \frac{2}{5}x^{\left(\frac{5}{2}\right)} + c$

10. $\int dx = ?$ $\quad x + c$

11. $\int \frac{x \cdot \sqrt{x}}{\sqrt[4]{x}} dx = ?$ $\quad \frac{4}{9}x^{\left(\frac{9}{4}\right)} + c$

12. $\int \sqrt[4]{x^7}\,dx = ?$ $\quad \frac{4}{11}x^{\left(\frac{11}{4}\right)} + c$

13. $\int \sqrt[6]{x^{-2}}\,dx = ?$ $\quad \frac{3}{2}x^{\left(\frac{2}{3}\right)} + c$

14. $\int x^{-5} dx = ?$ $\quad -\frac{1}{4} \cdot x^{-4} + c$

15. $\int \frac{1}{\sqrt{x^{-4}}}\,dx = ?$

$\frac{x^3}{3} + c$

16. $\int \frac{1}{\sqrt[6]{x^4}}\,dx = ?$

$3 \cdot \sqrt[3]{x} + c$

17. $\int x^{\left(\frac{7}{2}\right)}\,dx = ?$

$\frac{2}{9}x^{\left(\frac{9}{2}\right)} + c$

18. $\int x^{\left(-\frac{4}{3}\right)}\,dx = ?$

$-3 \cdot \frac{1}{\sqrt[3]{x}} + c$

19. $\int x^5 \cdot x^{\left(-\frac{9}{2}\right)}\,dx = ?$

$\frac{2}{3}x^{\left(\frac{3}{2}\right)} + c$

20. $\int x^3 \cdot x^{-7}\,dx = ?$

$-\frac{1}{3x^3} + c$

21. $\int \frac{x}{\sqrt{x}}\,dx = ?$

$\frac{2}{3} \cdot x\sqrt{x} + c$

22. $\int \frac{x^4}{\sqrt[3]{x^2}}\,dx = ?$

$\frac{3}{13}\sqrt[3]{x^{13}} + c$

23. $\int \frac{x^{\left(-\frac{9}{2}\right)}}{\sqrt[6]{x^3}}\,dx = ?$

$-\frac{1}{4x^4} + c$

24. $\int \frac{x^{\left(\frac{5}{4}\right)}}{\sqrt{x^{\left(\frac{5}{2}\right)}}}\,dx = ?$

$x + c$

25. $\int \frac{x^{65538}}{x^{65536}}\,dx = ?$

$\frac{x^3}{3} + c$

26. $\int \frac{x^{102}}{x^{-102}}\,dx = ?$

$\frac{x^{205}}{205} + c$

27. $\int x^{-1}\,dx = ?$

$\ln|x| + c$

28. $\int \frac{x^4}{x^5}\,dx = ?$

$\ln|x| + c$

29. $\int x^{-2}\,dx = ?$

$-\frac{1}{x} + c$

30. $\int \frac{x^{-8}}{x^{-7}}\,dx = ?$

$\ln|x| + c$

31. $\int \frac{1}{x+6}\,dx = ?$

$\ln|x+6| + c$

32. $\int \frac{1}{x-4}\,dx = ?$

$\ln|x-4| + c$

ÖZELLİK | Property 2

- $\int k \cdot f(x)\,dx = k \cdot \int f(x)\,dx \qquad k \in R$
- $\int [f(x) \pm g(x)]dx = \int f(x)\,dx \pm \int g(x)\,dx$

1. $\int 6x^3 dx = ?$

$\frac{3}{2}x^4 + c$

2. $\int 10x dx = ?$

$5x^2 + c$

3. $\int 4dx = ?$

$4x + c$

4. $\int y dx = ?$

$yx + c$

5. $\int y^2 dz = ?$

$y^2 \cdot z + c$

6. $\int xy dx = ?$

$\frac{y \cdot x^2}{2} + c$

7. $\int (2y^3 + 3y^2)\,dy = ?$

$\frac{y^4}{2} + y^3 + c$

8. $\int (x^2y + y)\,dx = ?$

$\frac{x^3y}{3} + xy + c$

9. $\int (x^3 + x^2 - 7x + 3)\,dx = ?$

$\frac{x^4}{4} + \frac{x^3}{3} - \frac{7x^2}{2} + 3x + c$

10. $\int (x^{1999} + 4x^{7619} - 2)\,dy = ?$

$(x^{1999} + 4x^{7619} - 2)y + c$

11. $\int \left(\frac{3}{x^2} + \frac{4}{x} - 5\right)dx = ?$

$-\frac{3}{x} + 4\ln x - 5x + c$

12. $\int (2x^{-5} + x^{-3} + 6x^{-1})\,dx = ?$

$\frac{x^{-4}}{-2} + \frac{x^{-2}}{-2} + 6\ln x + c$

13. $\int (x^3 + \sqrt[3]{x})\,dx = ?$

$\frac{x^4}{4} + \frac{3}{4}x^{\left(\frac{4}{3}\right)} + c$

14. $\int 2x \cdot t\,dx = ?$

$x^2t + c$

15. $\int 2x \cdot t\,dt = ?$

$xt^2 + c$

16. $\int (x+3)\cdot(x-3)\,dx = ?$

$\frac{x^3}{3} - 9x + c$

17. $\int \frac{x^2+4x+6}{x}\,dx = ?$

$\frac{x^2}{2} + 4x + 6\ln x + c$

18. $\int \frac{x^2+1}{\sqrt{x}}\,dx = ?$

$\frac{2}{5}x^{\left(\frac{5}{2}\right)} + 2\sqrt{x} + c$

19. $\int \left(\left(\sqrt{x} + \sqrt[3]{x^2}\right)\cdot x^{-1}\right)dx = ?$

$2\sqrt{x} + \frac{3}{2}\cdot\sqrt[3]{x^2} + c$

20. $\int \left(\sqrt[3]{x} - \frac{1}{x^7} + \frac{2}{x^3}\right)dx = ?$

$\frac{3}{4}x^{\left(\frac{4}{3}\right)} + \frac{x^{-6}}{6} - x^{-2} + c$

21. $\int \frac{(3x-6)^2 - 36}{x^2}\,dx = ?$

$9x - 36\cdot\ln x + c$

22. $\int \frac{\left(x^2y^2 + x^3y^{-2}\right)}{xy}\,dx = ?$

$\frac{x^2y}{2} + \frac{x^3y^{-3}}{3} + c$

23. $\int (4x^3 + 5x^2 - 6)\,dy = ?$

$(4x^3 + 5x^2 - 6)y + c$

24. $\int \frac{x^2-1}{y}\,dy = ?$

$(x^2 - 1)\cdot\ln y + c$

25. $\int x(x-1)^2\,dx = ?$

$\frac{x^4}{4} - \frac{2}{3}x^3 + \frac{x^2}{2} + c$

ÖZELLİK | Property 3

- $\int \sin x dx = -\cos x + c$
- $\int \cos x dx = \sin x + c$

1. $\int (\sin x + \cos x)\,dx = ?$

sinx – cosx + c

2. $\int 2\sin x dx + \int (1 - 2\sin x)\,dx = ?$

x + c

3. $\int \sin^2 x dx + \int \cos^2 x dx = ?$

x + c

4. $\int (x^3 + \sqrt{x} + \sin x)dx = ?$

$\frac{x^4}{4} + \frac{2}{3}x^{\left(\frac{3}{2}\right)} - \cos x + c$

5. $\int \frac{\sin^2 x}{1 - \cos x} dx = ?$

x + sinx + c

6. $\int \left(\frac{7}{2} \cdot \cos x + 4\right)dx = ?$

$\frac{7}{2} \cdot \sin x + 4x + c$

7. $\int (-2\sin x + 3\cos x)\,dx = ?$

2cosx + 3sinx + c

8. $\int \frac{1 - \sin^2 x}{\cos x} dx = ?$

sinx + c

9. $\int \frac{1 - \cos^2 x}{\sin^2 x} dx = ?$

x + c

ÖZELLİK | Property 4

- $\int a^x dx = \frac{a^x}{\ln a} + c$

1. $\int 3^x dx = ?$

$\frac{3^x}{\ln 3} + c$

2. $\int (4^x + 4) dx = ?$

$\frac{4^x}{\ln 4} + 4x + c$

3. $\int (e + e^x) dx = ?$

$e \cdot x + e^x + c$

4. $\int \left(e^{x+4} + \frac{1}{x}\right) dx = ?$

$e^{x+4} + \ln x + c$

5. $\int \frac{e^x + e^{2x}}{e^x} dx = ?$

$x + e^x + c$

6. $\int \left(\frac{12^x - 9^x}{3^x}\right) dx = ?$

$\frac{4^x}{\ln 4} - \frac{3^x}{\ln 3} + c$

7. $\int e^{x+y} dy = ?$

$e^{x+y} + c$

8. $\int 2^{x+4} dx = ?$

$\frac{2^{x+4}}{\ln 2} + c$

9. $\int 6^x \ln 6 \, dx = ?$

$6^x + c$

10. $\int \frac{e^{2x} - 1}{e^x - 1} dx = ?$

$e^x + x + c$

11. $\int 16^x \cdot \ln 2 dx = ?$

$2^{4x-2} + c$

ÖZELLİK | Property 5

- $\int \left(\frac{df(x)}{dx}\right)dx = f(x) + c$
- $\frac{d}{dx}\left(\int f(x)\,dx\right) = f(x)$
- $d\int f(x)\,dx = f(x)\,dx$

1. $\frac{d}{dx}\int (x^3 + \sin x)\,dx = ?$

$x^3 + \sin x$

2. $d\int (\cos^2 x)\,dx = ?$

$\cos^2 x dx$

3. $\int \left(\frac{d}{dx}\cdot\left(\frac{x^2+1}{3x}\right)\right)dx = ?$

$\frac{x^2+1}{3x} + c$

4. $\int f(x)\,dx = x^3 + 4x + 3$

$\Rightarrow f(x) = ?$

$3x^2 + 4$

5. $\int f(x)\,dx = x^2 - \sin x + 7$

$\Rightarrow f(x) = ?$

$2x - \cos x$

6. $\int x \cdot f(x)\,dx = 3x^4 - x^3 + 10$

$\Rightarrow f(x) = ?$

$12x^2 - 3x$

7. $\frac{df(x)}{dx} = 6x^2 - 10x$

$\Rightarrow f(x) = ?$

$2x^3 - 5x^2 + c$

8. $f'(x) = x^3 + \cos x$

$\Rightarrow f(x) = ?$

$\frac{x^4}{4} + \sin x + c$

9. $f'(x) = 4x + 1$

$f(0) = 7$

$\Rightarrow f(1) = ?$

10

10. $f'(x) = 6x^2 - 2x + 1$

$f(0) = 2$

$\Rightarrow f(2) = ?$

16

11. $f'(x) = x^3 - x$

$f(1) = 7$

$\Rightarrow f(0) = ?$

$\frac{29}{4}$

12. $d\int (x \ln x)\,dx = ?$

$x \cdot \ln x dx$

13. $\int d(\sin x) = ?$

$\sin x + c$

ÖZELLİK | Property 6

Diferansiyel Kavram | Concept of Differential

- $df(x) = \left(\frac{df(x)}{dx}\right)dx$

Örnek | Example

1. $d(\sin x) = \cos x dx$
2. $d(x^3) = 3x^2 dx$
3. $d(x^2 + x) = (2x + 1)dx$

Örnek | Example

$\int 2x^4 d(x^2)$

Çözüm | Answer – 1

$x^2 = t$

$x^4 = t^2$

$\Rightarrow \int 2t^2 dt = \frac{2t^3}{3} + c = \frac{2x^6}{3} + c$

Çözüm | Answer – 2

$d(x^2) = 2x \cdot dx$

$\int 2x^4 d(x^2)$

$\Rightarrow \int 2x^4 \cdot 2x dx$

$\Rightarrow \int 4x^5 dx$

$\Rightarrow 4\frac{x^6}{6} + c = \frac{2x^6}{3} + c$

1. $\int 2x d(x^3) = ?$

$\frac{6}{4}x^4 + c$

2. $\int \sin^3 x d(\sin x) = ?$

$\frac{\sin^4 x}{4} + c$

3. $\int (x^4 + x^2) d(x^3) = ?$

$\frac{3}{7}x^7 + \frac{3}{5}x^5 + c$

4. $\int d(\sin x) = ?$

$\sin x + c$

5. $\int d(\ln x) = ?$

$\ln x + c$

6. $\int d(2^x) = ?$

$2^x + c$

7. $\int d(\tan x) = ?$

$\tan x + c$

8. $\int d(e^x - e^{-x} + \sin x) = ?$

$e^x - e^{-x} + \sin x + c$

9. $\int (x^2 - 1) d(-x) = ?$

$-\frac{x^3}{3} + x + c$

10. $\int \frac{d(e^{2x} + 1)}{e^{2x}} = ?$

$2x + c$

11. $\int \frac{d(x^3 + 1)}{x^3 + 1} = ?$

$\ln|x^3 + 1| + c$

12. $\int \sin^2 x d(\cot x) = ?$

$-x + c$

13. $\frac{d}{dx}\left(\int \frac{1}{1 + x^4} dx\right) = ?$

$\frac{1}{1 + x^4}$

ÖZELLİK | Property 7

$\int f'(x)\cdot g(f(x))dx$ $\qquad f(x) = u$

$\Rightarrow \int g(u)du$ $\qquad f'(x)dx = du$

İntegrali alınan ifade (g(u))du gibi daha basit fonksiyona dönüştürülerek integral alınır.

To take the integral of the expression it could be first converted to g(u)du

- $\int f'(x)\cdot f^n(x)dx = \frac{f^{n+1}(x)}{n+1} + c \qquad (n \neq -1)$
- $\int \frac{f'(x)}{f(x)}dx = \ln|f(x)| + c$
- $\int f'(x)e^{f(x)}dx = e^{f(x)} + c$
- $\int f'(x)\cdot \sin(f(x))dx = -\cos(f(x)) + c$
- $\int f'(x)\cos(f(x))dx = \sin(f(x)) + c$

1. $\int (x^2+1)^2\cdot 2x\,dx = ?$

$\frac{(x^2+1)^3}{3} + c$

2. $\int (x^4+2)^6\cdot 4x^3dx = ?$

$\frac{(x^4+2)^7}{7} + c$

3. $\int e^{\sin x}\cdot \cos x\,dx = ?$

$e^{\sin x} + c$

4. $\int \frac{e^{2x}}{e^{2x}+4}dx = ?$

$\frac{1}{2}\ln|e^{2x}+4| + c$

5. $\int \frac{\ln^3 x}{x}dx = ?$

$\frac{\ln^4 x}{4} + c$

6. $\int 2\cdot \sin x\cdot \cos x\,dx = ?$

$\sin^2 x + c$

7. $\int \frac{2^{\sqrt{x}}}{2\sqrt{x}}dx = ?$

$\frac{2^{\sqrt{x}}}{\ln 2} + c$

8. $\int \frac{\cos x}{\sin x}dx = ?$

$\ln|\sin x| + c$

9. $\int \tan x\,dx = ?$

$-\ln|\cos x| + c$

10. $\int 5(x^3+2x)^4\cdot(3x^2+2)dx = ?$

$(x^3+2x)^5 + c$

11. $\int \frac{2x+3}{x^2+3x}\,dx = ?$

$\ln|x^2+3x| + c$

12. $\int \sin^2 x \cdot \sin(2x)\,dx = ?$

$\frac{\sin^4 x}{2} + c$

13. $\int 8 \cdot \cos^3 x \cdot \sin x\,dx = ?$

$-2\cos^4 x + c$

14. $\int (2x^3+3)^3 \cdot x^2\,dx = ?$

$\frac{1}{24}(2x^3+3)^4 + c$

15. $\int \frac{x}{2x^2+1}\,dx = ?$

$\frac{1}{4}\ln|2x^2+1| + c$

16. $\int (x^2-7)^9 \cdot \frac{x}{2}\,dx = ?$

$\frac{1}{40}(x^2-7)^{10} + c$

17. $\int g^2(x) \cdot g'(x)\,dx = ?$

$\frac{g^3(x)}{3} + c$

18. $\int \sin(2x)\,dx = ?$

$\frac{-\cos(2x)}{2} + c$

19. $\int \cos^2(4x)\,dx - \int \sin^2(4x)\,dx = ?$

$\frac{\sin(8x)}{8} + c$

20. $\int \frac{dx}{x \cdot \ln x} = ?$

$\ln(\ln x) + c$

21. $\int \frac{e^{\ln x}}{x}\,dx = ?$

$x + c$

22. $\int \frac{4}{16x^2-8x+1}\,dx = ?$

$-\frac{1}{4x-1} + c$

23. $\int \frac{x-1}{(x+1)^3}\,dx = ?$

$-\frac{1}{(x+1)} + \frac{1}{(x+1)^2} + c$

24. $\int e^{4x^2-4x} \cdot (2x-1)\,dx = ?$

$\frac{1}{4} \cdot e^{4x^2-4x} + c$

ÖZELLİK | Property 8

$$\int f(x)\,dx = G(x) + c$$

$$\Rightarrow \int f(ax+b)\,dx = \frac{G(ax+b)}{a} + c$$

1. $\int (2x+7)^4 dx = ?$ $\quad \frac{(2x+7)^5}{10} + c$

2. $\int (3x+1)^2 dx = ?$ $\quad \frac{(3x+1)^3}{9} + c$

3. $\int \sin(4x+1)\,dx = ?$ $\quad \frac{-\cos(4x+1)}{4} + c$

4. $\int \cos(5x-7)\,dx = ?$ $\quad \frac{1}{5}\sin(5x-7) + c$

5. $\int e^{3x-1} dx = ?$ $\quad \frac{1}{3}e^{3x-1} + c$

6. $\int \frac{1}{7x-1} dx = ?$ $\quad \frac{1}{7}\ln|7x-1| + c$

7. $\int \sqrt{5x-1}\,dx = ?$ $\quad \frac{2}{15}\cdot\sqrt{(5x-1)^3} + c$

8. $\int \sqrt[3]{2x+1}\,dx = ?$ $\quad \frac{3}{8}\cdot\sqrt[3]{(2x+1)^4} + c$

ÖZELLİK | Property 9

- $\int \sin^m x \cdot \cos^n x dx$

  Üssü çift olan ifadeye u denir.

  An expression with an even exponent is called u.

- $\int \cos^2 x dx = \int \frac{\cos(2x)+1}{2} dx$

- $\int \sin^2 x dx = \int \frac{1-\cos(2x)}{2} dx$

1. $\int \sin x \cdot \cos x\,dx = ?$ $\quad \frac{\sin^2 x}{2} + c$

2. $\int \sin^4 x \cdot \cos x\,dx = ?$ $\quad \frac{\sin^5 x}{5} + c$

3. $\int \cos^5 x \cdot \sin x\,dx = ?$ $\quad \frac{-\cos^6 x}{6} + c$

4. $\int \sin^2 x \cdot \cos^3 x\,dx = ?$ $\quad \frac{\sin^3 x}{3} - \frac{\sin^5 x}{5} + c$

5. $\int \sin^3 x\,dx = ?$ $\quad \frac{\cos^3 x}{3} - \cos x + c$

6. $\int \cos^3 x\,dx = ?$ $\quad \sin x - \frac{\sin^3 x}{3} + c$

7. $\int \sin^2 x\,dx = ?$ $\quad \frac{1}{2}\left(x - \frac{\sin(2x)}{2}\right) + c$

8. $\int \cos^2 x\,dx = ?$ $\quad \frac{1}{2}\left(\frac{\sin(2x)}{2} + x\right) + c$

ÖZELLİK | Property 10

$\sqrt{1-x^2}$ $x = \sin t$ dönüşümü yapılır.

If integrand contains $\sqrt{1-x^2}$ let $x = \sin t$

$\sqrt{a^2-x^2}$ $x = a \cdot \sin t$ dönüşümü yapılır.

If integrand contains $\sqrt{a^2-x^2}$ let $x = a \cdot \sin t$

$1 + x^2$ $x = \tan t$ dönüşümü yapılır.

If integrand contains $1 + x^2$ let $x = \tan t$

$a^2 + x^2$ $x = a \cdot \tan t$ dönüşümü yapılır.

If integrand contains $a^2 + x^2$ let $x = a \tan t$

- $\displaystyle\int \frac{1}{\sqrt{1-x^2}}\,dx = \arcsin x + c$
  $= -\arccos x + c$
- $\displaystyle\int \frac{1}{1+x^2}\,dx = \arctan x + c$
  $= -\operatorname{arccot} x + c$

1. $\displaystyle\int \frac{1}{\sqrt{4-x^2}}\,dx$

$\boxed{\arcsin\left(\frac{x}{2}\right) + c}$

2. $\displaystyle\int \frac{3}{9+25x^2}\,dx = ?$

$\boxed{\frac{1}{5}\arctan\left(\frac{5x}{3}\right)}$

3. $\displaystyle\int \frac{1}{16+x^2}\,dx = ?$

$\boxed{\frac{1}{4}\arctan\left(\frac{x}{4}\right) + c}$

4. $\displaystyle\int \frac{1}{9x^2+24x+20}\,dx = ?$

$\boxed{\frac{1}{6}\arctan\left(\frac{3x+4}{2}\right) + c}$

5. $\displaystyle\int \frac{1}{(x-7)^2+9}\,dx = ?$

$\boxed{\frac{1}{3}\arctan\left(\frac{x-7}{3}\right) + c}$

6. $\displaystyle\int \frac{1}{\sqrt{20x-4x^2}}\,dx = ?$

$\boxed{\frac{1}{2}\arcsin\left(\frac{2x-5}{5}\right) + c}$

7. $\displaystyle\int \frac{x}{1+x^4}\,dx = ?$

$\boxed{\frac{1}{2}\arctan(x^2) + c}$

8. $\displaystyle\int \frac{2^x}{1+4^x}\,dx = ?$

$\boxed{-\frac{1}{\ln 2}\operatorname{arccot}(2^x) + c}$

9. $\displaystyle\int \frac{7}{\sqrt{1-49x^2}}\,dx = ?$

$\boxed{-\arccos(7x) + c}$

10. $\displaystyle\int \frac{1}{x^2+4x+13}\,dx = ?$

$\boxed{-\frac{1}{3}\operatorname{arccot}\left(\frac{x+2}{3}\right) + c}$

ÖZELLİK | Property 11

Basit Kesirlere Ayırma | Simple Fractionization

P(x) ve Q(x) polinom *(polynomial)*

$$\int \frac{P(x)}{Q(x)}\,dx$$

dP(x) ≥ dQ(x) ise kalanlı bölme işlemi yapılarak ifade basit kesirlere ayrılır.

If dp(x)-dQ(x), by long division it can be fractionized.

Örnek | Example

$$\int \left(\frac{x^3+3x+7}{x}\right)dx = ?$$

Çözüm | Answer

$$\int \left(\frac{x^3+3x+7}{x}\right)dx = \int \left(\frac{x^3}{x}+\frac{3x}{x}+\frac{7}{x}\right)dx$$

$$= \int \left(x^2+3+\frac{7}{x}\right)dx$$

$$= \frac{x^3}{3}+3x+7\cdot\ln|x|+c$$

1. $\int \frac{x^2+4x}{x}\,dx = ?$

$\frac{x^2}{2}+4x+c$

2. $\int \frac{x^3-1}{2x}\,dx = ?$

$\frac{x^3}{6}-\frac{1}{2}\ln|x|+c$

3. $\int \frac{4x+2}{x+1}\,dx = ?$

$4x-2\cdot\ln|x+1|+c$

4. $\int \frac{x^2-3x+1}{x-1}\,dx = ?$

$\frac{x^2}{2}-2x-\ln|x-1|+c$

5. $\int \frac{x^2+2x+7}{x-3}\,dx = ?$

$\frac{x^2}{2}+5x+22\ln|x-3|+c$

6. $\int \frac{x^2-x+3}{x+1}\,dx = ?$

$\frac{x^2}{2}-2x+5\ln|x+1|+c$

7. $\int \frac{x^2+4}{x^2+1}\,dx = ?$

$x+3\cdot\arctan x+c$

8. $\int \frac{3x+1}{2x-2}\,dx = ?$

$\frac{3}{2}x+2\ln|x-1|+c$

9. $\int \frac{2x^2-x+5}{x+1}\,dx = ?$

$x^2-3x+8\ln|x+1|+c$

10. $\int \frac{5x+1}{2x-1}\,dx = ?$

$\frac{5}{2}x+\frac{7}{4}\ln|2x-1|+c$

ÖZELLİK | Property 12

$$\int \frac{P(x)}{Q(x)}\,dx$$

$dP(x) < dQ(x)$ ise bölme işlemi yapılamaz. Bu durumda, $Q(x)$ çarpanlarına ayrılarak çarpım durumundaki ifadeler aşağıdaki özelliklere göre toplam durumuna çevrilir.

If $dP(x) < dQ(x)$ division operation cannot be applied. In this case, expression with multiplication form are converted to addition form.

- $$\frac{mx+n}{(ax+b)\cdot(cx+d)} = \frac{A}{ax+b} + \frac{B}{cx+d}$$
- $$\frac{mx^2+nx+p}{(ax^2+bx+c)\cdot(dx+e)} = \frac{Ax+B}{ax^2+bx+c} + \frac{C}{dx+e}$$

Örnek | Example

$$\int \frac{3x+4}{x^2+3x+2}\,dx = ?$$

Çözüm | Answer

$$\int \frac{3x+4}{x^2+3x+2}\,dx = \int \frac{3x+4}{(x+1)\cdot(x+2)}\,dx$$

$$\frac{3x+4}{(x+1)\cdot(x+2)} = \frac{A}{x+1} + \frac{B}{x+2}$$

$$3x+4 = A(x+2) + B(x+1)$$

$$x=-2 \Rightarrow 3\cdot(-2)+4 = A\cdot(2-2) + B\cdot(-2+1)$$
$$-2 = -B$$
$$2 = B$$

$$x=-1 \Rightarrow 3\cdot(-1)+4 = A\cdot(-1+2) + B\cdot(-1+1)$$
$$1 = A$$

$$\int \frac{3x+4}{(x+1)(x+2)}\,dx = \int \left(\frac{1}{x+1} + \frac{2}{x+2}\right)dx$$
$$= \int \frac{1}{x+1}\,dx + \int \frac{2}{x+2}\,dx$$
$$= \ln|x+1| + 2\ln|x+2| + c$$
$$= \ln\left|(x+1)\cdot(x+2)^2\right| + c$$

1. $\int \frac{1}{x(x+1)}\,dx = ?$

$\ln\left|\frac{x}{x+1}\right| + c$

2. $\int \frac{1}{x(x+3)}\,dx = ?$

$\frac{1}{3}\ln\left|\frac{x}{x+3}\right| + c$

3. $\int \frac{1}{x^2-9}\,dx = ?$

$\frac{1}{6}\ln\left|\frac{x-3}{x+3}\right| + c$

4. $\int \frac{1}{4x^2-9}\,dx = ?$

$\frac{1}{12}\ln\left|\frac{2x-3}{2x+3}\right| + c$

5. $\int \frac{1}{(2x-1)(2x+3)}\,dx = ?$

$\frac{1}{8}\ln\left|\frac{2x-1}{2x+3}\right| + c$

6. $\int \frac{3x+1}{x^2-1}\,dx = ?$

$\ln|x+1| + 2\ln|x-1| + c$

7. $\int \frac{x-7}{x^2-2x-3}\,dx = ?$

$\ln\left|\frac{(x+1)^2}{x-3}\right| + c$

ÖZELLİK | Property 13

Kısmi İntegrasyon | Partial Integration

$$(u \cdot v)' = u' \cdot v + v' \cdot u$$

$$d(u \cdot v) = vdu + udv$$

$$udv = d(u \cdot v) - vdu$$

$$\int udv = \int d(u \cdot v) - \int vdu$$

$$\boxed{\int udv = u \cdot v - \int vdu}$$

Kısmi integrasyonda u ve dv'nin seçimi çok önemlidir. Bu seçim için aşağıda verilen sıralama göz önünde bulundurulur. Yukarıdan aşağıya inildikçe integral alma işlemi kolaylaşır.

The selection of u and dv in the partial integration is very important. For this selection the below ordering are to be taken into consideration. As going down taking integral gets easier.

L	Logaritma *(Logarithm)*
A	Arc (Ters Trigonometrik Fonksiyon) *Arc (Inverse Trigonometrical Function)*
P	Polinom *(Polynomial)*
T	Trigonometrik Fonksiyon (sin, cos, tan, cot) *Trigonometrical Function (sin, cos, tan, cot)*
Ü	Üstel Fonksiyon (a^x) *Exponential Function (a^x)*

Örnek | Example

$$\int x \cdot e^x dx = ?$$

Çözüm | Answer

$$\int x \cdot e^x dx$$

$x \rightarrow$ polinom *(polynomial)*

$e^x \rightarrow$ üstel fonksiyon *(exponential function)*

$x = u$ $\quad e^x dx = dv$

$dx = du$ $\quad e^x = v$

$$\int xe^x dx = \int u\,dv$$

$$= u \cdot v - \int vdu$$

$$= x \cdot e^x - \int e^x dx$$

$$= x \cdot e^x - e^x + c$$

1. $\int x \cdot \sin x dx = ?$

$\boxed{-x \cdot \cos x + \sin x + c}$

2. $\int x^2 \cdot e^x dx = ?$

$\boxed{e^x \cdot (x^2 - 2x + 2) + c}$

3. $\int \ln x dx = ?$

$\boxed{x \cdot \ln x - x + c}$

4. $\int \arccos x dx = ?$

$\boxed{x \cdot \arccos x - \sqrt{1 - x^2} + c}$

5. $\int \arctan x dx = ?$

$\boxed{x \cdot \arctan x - \frac{1}{2}\ln(1 + x^2) + c}$

6. $\int 4x \cdot \sin(3x)\,dx = ?$

$$\frac{-4x \cdot \cos(3x)}{3} + \frac{4\sin(3x)}{9} + c$$

7. $\int (2x-1) \cdot \cos(3x)\,dx = ?$

$$\frac{(2x-1) \cdot \sin(3x)}{3} + \frac{2 \cdot \cos(3x)}{9} + c$$

8. $\int (\log(2x))\,dx = ?$

$$\log(2) \cdot x + x \cdot \log|x| - x \cdot \log e + c$$

9. $\int 2^x \cdot x^2\,dx = ?$

$$2^x \cdot \left(\frac{x^2}{\ln 2} - \frac{2x}{(\ln 2)^2} + \frac{2}{(\ln 2)^3}\right) + c$$

10. $\int 2x \cdot \ln(2x)\,dx = ?$

$$x^2 \cdot \ln|2x| - \frac{x^2}{2} + c$$

11. $\int \ln(x^{2x+4})\,dx = ?$

$$\ln|x| \cdot (x^2 + 4x) - \frac{x^2}{2} - 4x + c$$

12. $\int (x^3 + x^2) \cdot e^{2x}\,dx = ?$

$$e^{2x}\left(\frac{x^3 + x^2}{2} - \frac{3x^2 + 2x}{4} + \frac{6x + 2}{8} - \frac{3}{8}\right) + c$$

13. $\int e^x \cdot \cos x\,dx = ?$

$$\frac{e^x}{2}(\cos x + \sin x) + c$$

14. $\int x \cdot \operatorname{cosec}^2 x\,dx = ?$

$$-x \cdot \cot x + \ln|\sin x| + c$$

15. $\int e^x \cdot \sin x\,dx = ?$

$$\frac{e^x}{2}[\sin x - \cos x] + c$$

ÖZELLİK | Property 14

Belirli İntegral | Definite Integral

$$\int f(x)\,dx = G(x) + c$$

$a, b \in R$

$$\int_a^b f(x)\,dx = G(x)\Big|_a^b = G(b) - G(a)$$

1. $\int_1^3 x\,dx = ?$ $\boxed{4}$

2. $\int_0^2 6x^2\,dx = ?$ $\boxed{16}$

3. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos x\,dx = ?$ $\boxed{\frac{\sqrt{3}-1}{2}}$

4. $\int_1^{e^4} \frac{1}{x}\,dx = ?$ $\boxed{4}$

5. $\int_1^3 (x^2 - x)\,dx = ?$ $\boxed{\frac{14}{3}}$

6. $\int_0^{\ln 7} e^x\,dx = ?$ $\boxed{6}$

7. $\int_0^1 \frac{1}{1+x^2}\,dx = ?$ $\boxed{\frac{\pi}{4}}$

ÖZELLİK | Property 15

$a, b \in R$

- $\int_a^b f(x)\,dx = -\int_b^a f(x)\,dx$
- $\int_a^a f(x)\,dx = 0$
- $\frac{d}{dx}\left(\int_a^b f(x)\,dx\right) = 0$
- $\int_a^b \left(\frac{d}{dx} f(x)\right) dx = f(b) - f(a)$

1. $\int_3^3 \left(\frac{2x-1}{3x+4}\right) dx = ?$ $\boxed{0}$

2. $\int_1^7 \frac{x^2}{x^3-1}\,dx + \int_7^1 \frac{x^2}{x^3-1}\,dx = ?$ $\boxed{0}$

3. $\frac{d}{dx}\int_1^7 \left(\frac{3x+1}{x^3}\right) dx = ?$ $\boxed{0}$

4. $\int_1^3 \left(\frac{d}{dx}\left(\frac{2x}{x+1}\right)\right) dx = ?$ $\boxed{\frac{1}{2}}$

5. $\int_1^{e^3} \left(\frac{d}{dx}(\ln x)\right) dx = ?$ $\boxed{3}$

ÖZELLİK | Property 16

$$\frac{d}{dx}\int_{g(x)}^{h(x)} f(x)\,dx = f(h(x))\cdot h'(x) - f(g(x))\cdot g'(x)$$

İspat | Proof

$$\boxed{\begin{aligned}&\int f(x)\,dx = G(x) + c\\ &G'(x) = f(x)\end{aligned}}$$

$$\frac{d}{dx}\int_{g(x)}^{h(x)} f(x)\,dx = \frac{d}{dx}\left(G(x)\Big|_{g(x)}^{h(x)}\right)$$

$$= \frac{d}{dx}(G(h(x)) - G(g(x))$$

$$= G'(h(x))\cdot h'(x) - G'(g(x))\cdot g'(x)$$

$$= f(h(x))\cdot h'(x) - f(g(x))\cdot g'(x)$$

1. $\frac{d}{dx}\int_{1}^{5}\left(\frac{x\cdot\cos x}{x+1}\right)dx = ?$

$\boxed{0}$

2. $\frac{d}{dx}\int_{4}^{x}\left(\frac{4x+1}{x-3}\right)dx = ?$

$\boxed{\frac{4x+1}{x-3}}$

3. $\frac{d}{dx}\int_{1}^{x^2}(x^3)\,dx = ?$

$\boxed{2x^7}$

4. $\frac{d}{dx}\int_{x}^{x^3}(x^2+1)\,dx = ?$

$\boxed{3x^8 + 2x^2 - 1}$

5. $\frac{d}{dx}\int_{2}^{x} e^{(x^2)}\,dx = ?$

$\boxed{e^{(x^2)}}$

6. $f(x) = \int_{x}^{x^3}(x^2 - x)\,dx$

$\Rightarrow f'(1) = ?$

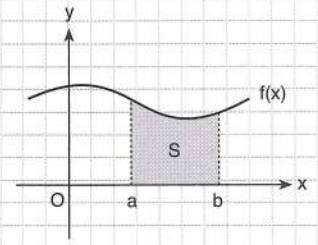
$\boxed{0}$

7. $f(x) = \int_{x^2}^{x^3-1}(4x+3)\,dx$

$\Rightarrow \left.\frac{df(x)}{dx}\right|_{x=1} = ?$

$\boxed{-5}$

ÖZELLİK | Property 17

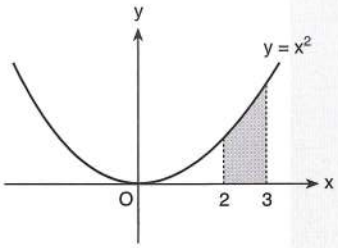


$$S = \int_a^b f(x)\,dx$$

Grafiklerde taralı olarak verilen alanlar kaç birimkaredir?

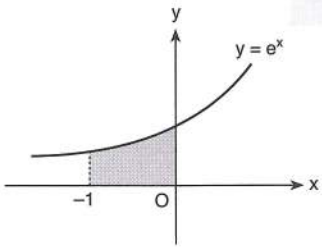
What is the square unit of the shaded area in the given graph?

1.



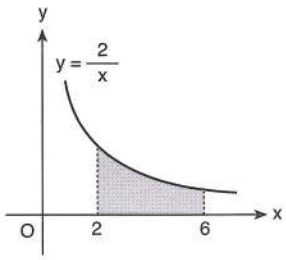
$\frac{19}{3}$

2.



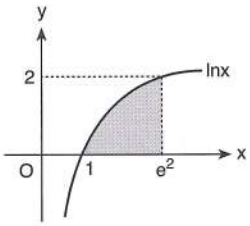
$\frac{e-1}{e}$

3.



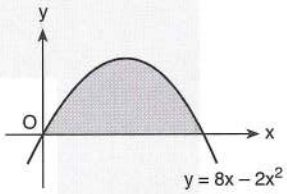
$\ln 9$

4.



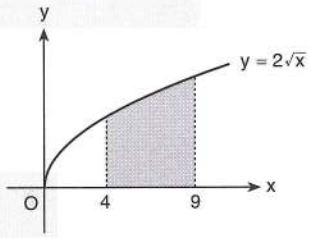
$e^2 + 1$

5.



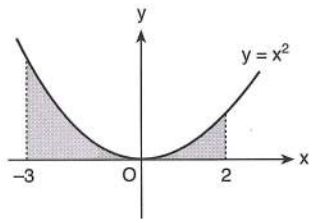
$\frac{64}{3}$

6.



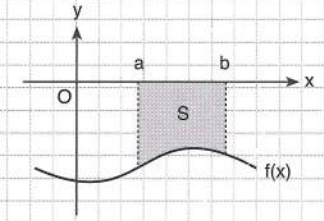
$\frac{76}{3}$

7.



$\frac{35}{3}$

ÖZELLİK | Property 18

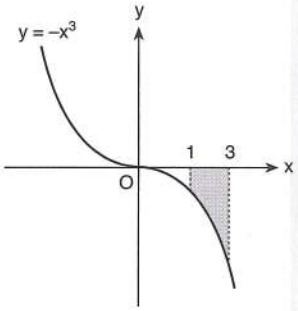


$$S = -\int_a^b f(x)\cdot d(x)$$

Grafiklerde taralı olarak verilen alanlar kaç birimkaredir?

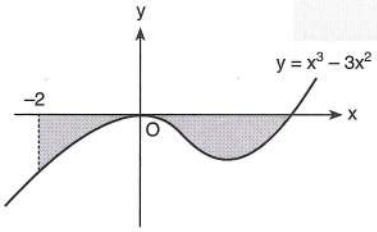
What is the square unit of the shaded area in the given graph?

1.



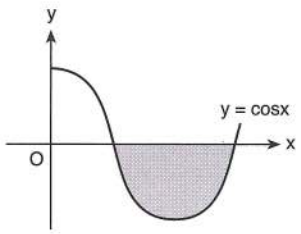
20

2.



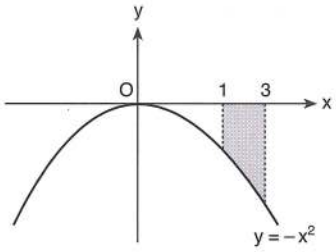
$\frac{75}{4}$

3.



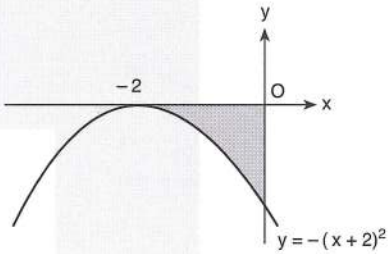
2

4.



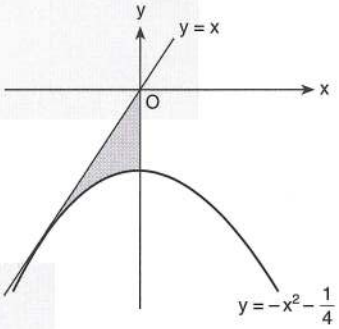
$\frac{26}{3}$

5.



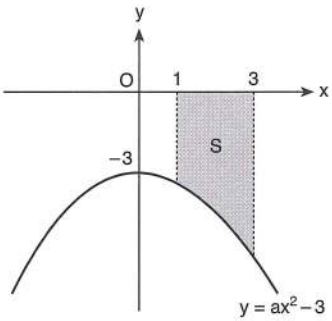
$\frac{8}{3}$

6.



$\frac{1}{24}$

7.

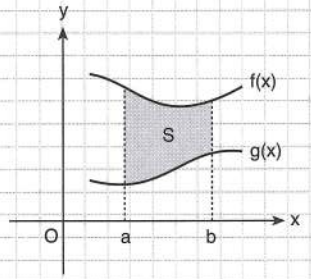


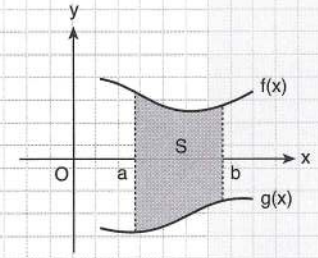
S = 32

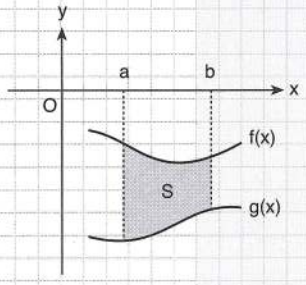
⇒ a = ?

−3

ÖZELLİK | Property 19







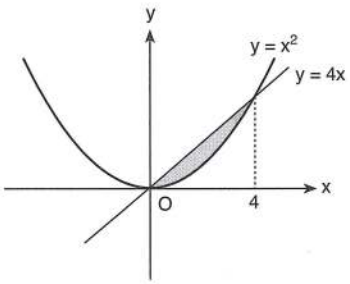
$$S = \int_a^b f(x)\cdot dx - \int_a^b g(x)\cdot d(x)$$

$$S = \int_a^b (f(x) - g(x))\cdot d(x)$$

Grafiklerde taralı olarak verilen alanlar kaç birimkaredir?

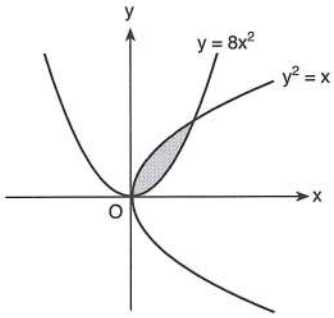
What is the square unit of the shaded area in the given graph?

1.



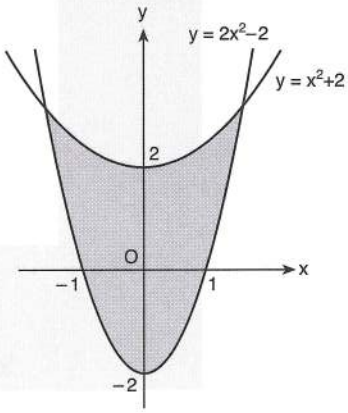
$\frac{32}{3}$

2.



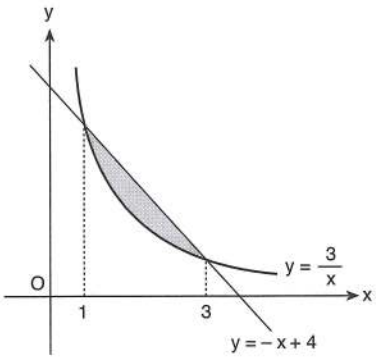
$\frac{1}{24}$

3.



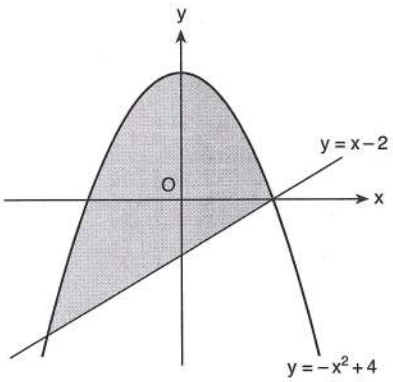
$\frac{32}{3}$

4.



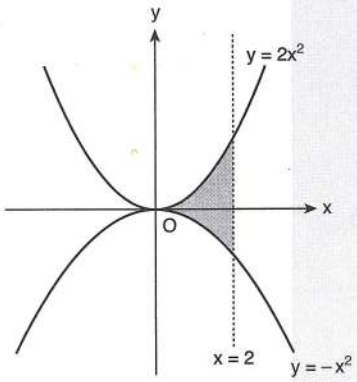
$4 - \ln 27$

5.



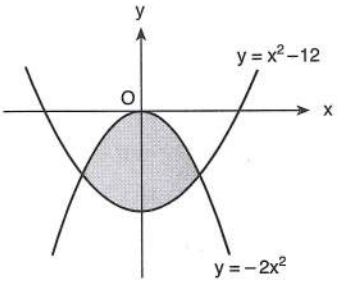
$\frac{125}{6}$

6.



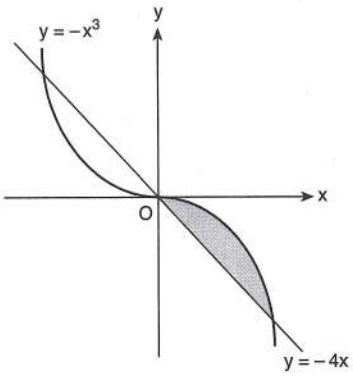
8

7.



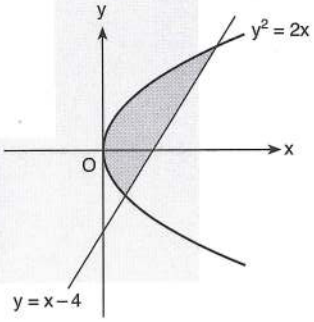
32

8.



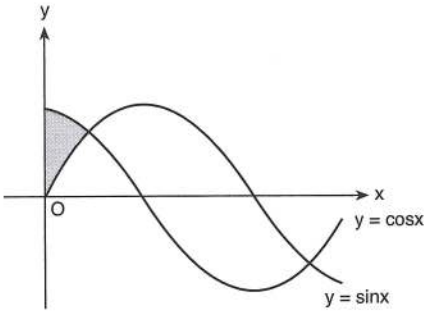
4

9.



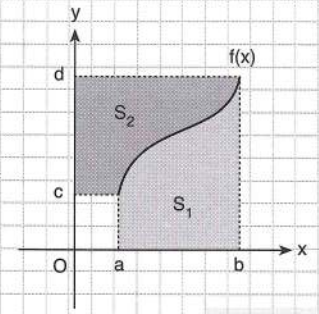
18

10.



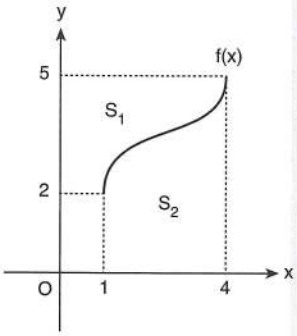
$\sqrt{2} - 1$

ÖZELLİK | Property 20



$$S_1 = \int_a^b f(x)\cdot dx \qquad S_2 = \int_c^d f^{-1}(x)\cdot dx$$

1.



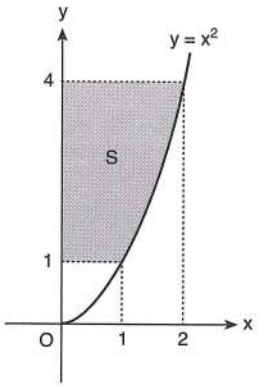
$$\Rightarrow \int_1^4 f(x)\,dx + \int_2^5 f^{-1}(x)\,dx = ?$$

18

Grafiklerde taralı olarak verilen alanlar kaç birimkaredir?

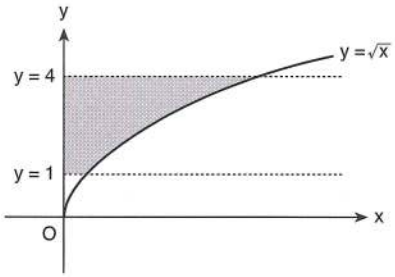
What is the square unit of the shaded area in the given graph?

2.



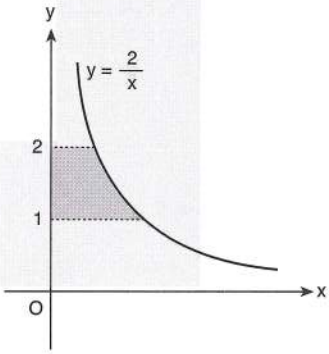
$\frac{14}{3}$

3.



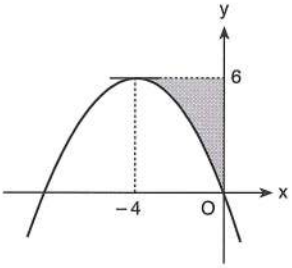
21

4.



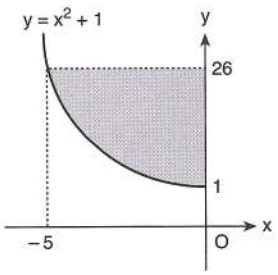
ln4

5.



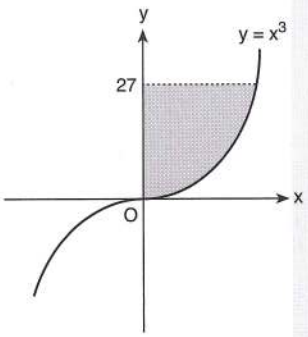
8

6.



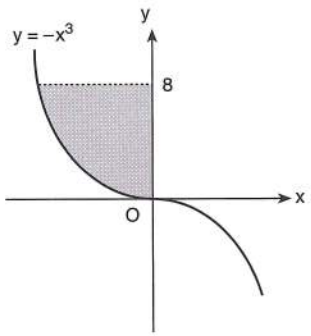
$\frac{250}{3}$

7.



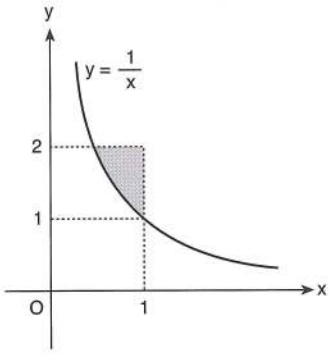
$\frac{243}{4}$

8.



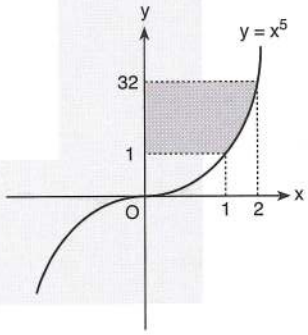
12

9.



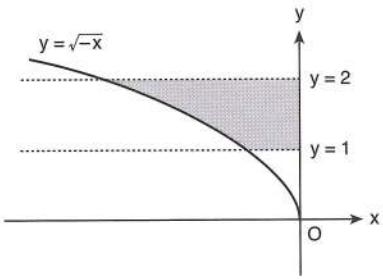
$1 - \ln 2$

10.



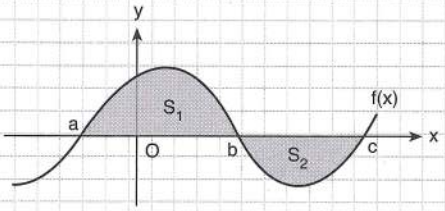
$\frac{105}{2}$

11.

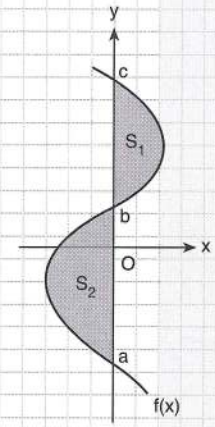


$\frac{7}{3}$

ÖZELLİK | Property 21

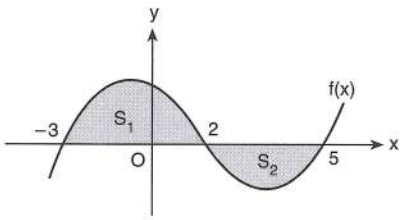


$$\int_a^b f(x)\cdot dx = S_1 \qquad -\int_b^c f(x)\cdot dx = S_2$$



$$S_1 = \int_b^c f^{-1}(x)\cdot dx \qquad S_2 = -\int_a^b f^{-1}(x)\cdot dx$$

1.



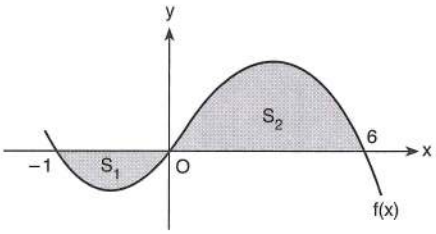
$S_1 = 16$

$S_2 = 7$

$\Rightarrow \int_{-3}^{5} f(x)\,dx = ?$

9

2.



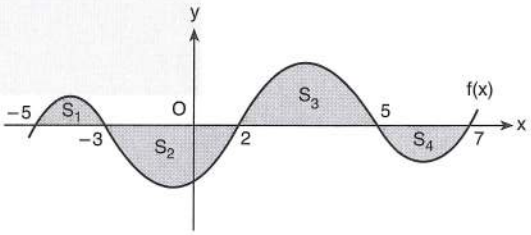
$S_1 = 4$

$S_2 = 10$

$\Rightarrow \int_{-1}^{6} f(x)\,dx = ?$

6

3.



$\int_{-5}^{7} f(x)\,dx = 10$

$S_1 = 2$

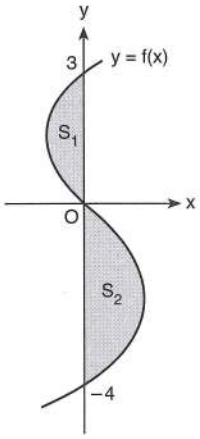
$S_2 = 4$

$S_4 = 3$

$\Rightarrow S_3 = ?$

15

4.



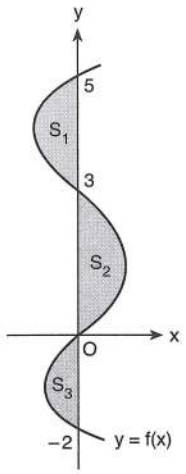
$S_1 = 4$

$S_2 = 6$

$\Rightarrow \int_{-4}^{3} f^{-1}(x)\,dx = ?$

2

5.



$\int_{-2}^{5} f^{-1}(x)\,dx = 1$

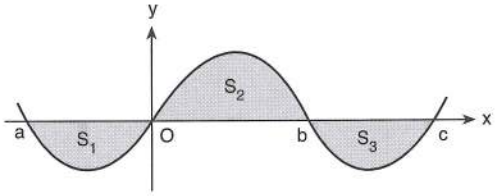
$S_1 = 4$

$S_2 = 7$

$\Rightarrow S_3 = ?$

2

6.



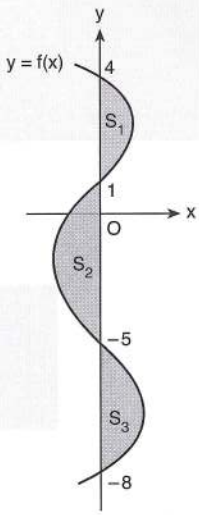
$\int_{a}^{c} f(x)\,dx = 14$

$-S_1 + S_2 + S_3 = 24$

$\Rightarrow S_3 = ?$

5

7.

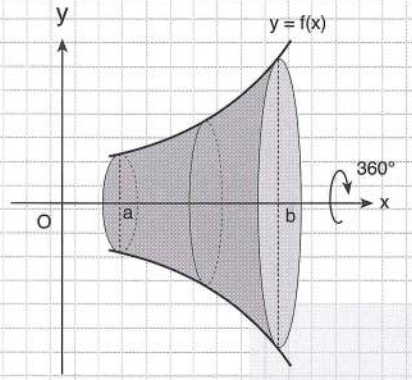


$\int_{-8}^{4} f^{-1}(x)\,dx = S_2$

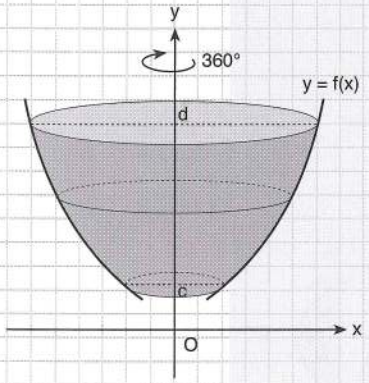
$\Rightarrow \dfrac{S_1 + S_3}{S_2} = ?$

2

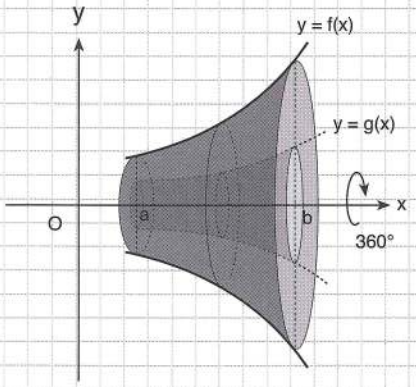
ÖZELLİK | Property 22



$$V = \pi \int_a^b f^2(x) \cdot dx$$



$$V = \pi \int_c^d \left(f^{-1}(x)\right)^2 \cdot dx$$

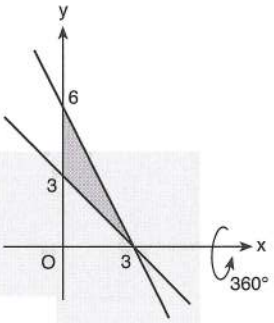


$$V = \pi \int_a^b \left(f^2(x) - g^2(x)\right) dx$$

Grafiklerde taralı olarak verilen alanlar, belirtilen eksen etrafında 360° döndürüldüğünde oluşan cismin hacmi kaç birimküptür?

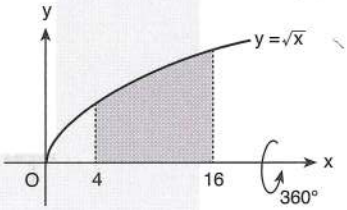
What is the unit cube of the object which is ocurred when the shaded area in the given graph is rotated 360 around the specified axis?

1.



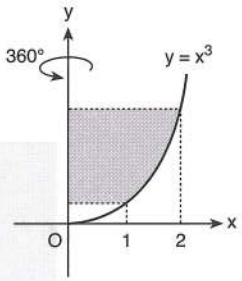
27π

2.



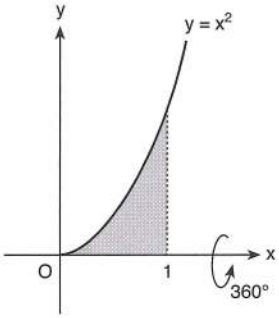
120π

3.



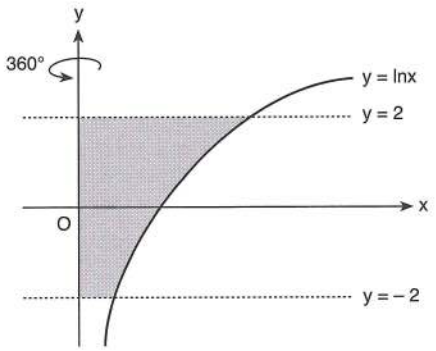
$\frac{93\pi}{5}$

4.



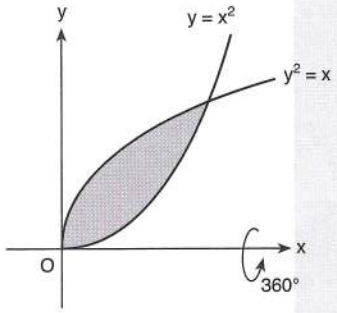
$\frac{\pi}{5}$

5.



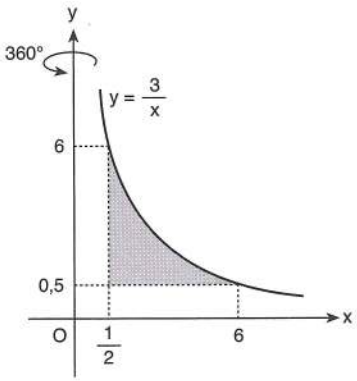
$\frac{1}{2}(e^4 - e^{-4})\pi$

6.



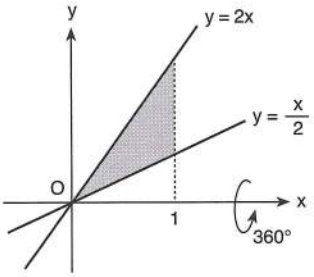
$\frac{3\pi}{10}$

7.



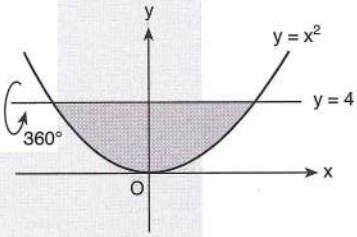
$\frac{121\pi}{8}$

8.



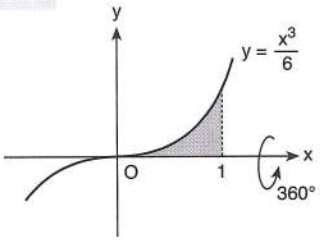
$\frac{5\pi}{4}$

9.



$\frac{512\pi}{15}$

10.

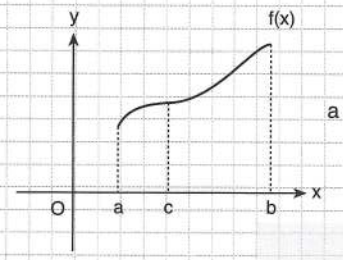


$\frac{\pi}{252}$

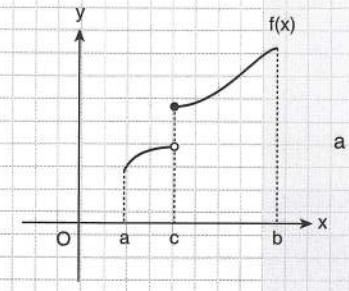
ÖZELLİK | Property 23

Özel Tanımlı Fonksiyonların İntegrali

Integral of the Defined Function



$$\int_a^b f(x)\,dx = \int_a^c f(x)\,dx + \int_c^b f(x)\,dx$$



$$\int_a^b f(x)\,dx = \int_a^c f(x)\,dx + \int_c^b f(x)\,dx$$

Kritik noktalara göre özel tanımlı fonksiyonların integrali

Integral of the defined functions according to the critical points

- $f(x) = \begin{cases} h(x) & x \geq a \\ g(x) & x < a \end{cases}$ a kritik nokta *(critical point)*
- $f(x) = |g(x)|$, $g(a) = 0$ a kritik nokta *(critical point)*
- $f(x) = \text{sgn}(g(x))$, $g(a) = 0$ a kritik nokta *(critical point)*
- $f(x) = [\![g(x)]\!]$, $g(a) \in Z$ a kritik nokta *(critical point)*

1. $f(x) = \begin{cases} x^2 & x > 2 \\ 2x & x \leq 2 \end{cases} \Rightarrow \int_0^3 f(x)\,dx = ?$

$\frac{31}{3}$

2. $f(x) = \begin{cases} x+1 & x \geq 1 \\ x^3 & x < 1 \end{cases} \Rightarrow \int_0^2 f(x)\,dx = ?$

$\frac{11}{4}$

3. $f(x) = \begin{cases} 4x^2 & x < -2 \\ 3 & x = -2 \\ -2x & x > -2 \end{cases} \Rightarrow \int_{-3}^1 f(x)\,dx = ?$

$\frac{85}{3}$

4. $\int_{-2}^4 |x|\,dx = ?$

10

5. $\int_0^3 |x-2|\,dx = ?$

$\frac{5}{2}$

6. $\int_{-3}^3 |x^2-4|\,dx = ?$

$\frac{46}{3}$

7. $\int_0^3 |x^2+1|\,dx = ?$

12

8. $\int_{-2}^{10} \operatorname{sgn}(x)\,dx = ?$

8

9. $\int_0^{20} \operatorname{sgn}(x-4)\,dx = ?$

12

10. $\int_0^3 [x]\,dx = ?$

3

11. $\int_0^8 \left[\frac{x}{2}\right] dx = ?$

12

12. $\int_0^4 [x+4]\,dx = ?$

22

ÖZELLİK | Property 24

$f: R \longrightarrow R$

$f(-x) = f(x)$ f çift fonksiyon *(f dual function)*

Çift fonksiyonlar y eksenine göre simetriktir.
Dual functions are symmetrical in relation to y axis.

$$\int_{-a}^{a} f(x)\,dx = 2\int_{0}^{a} f(x)\,dx \qquad a \in R$$

ÖZELLİK | Property 25

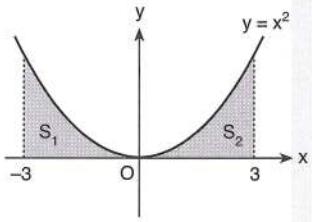
$f: R \longrightarrow R$

$f(-x) = -f(x)$ f tek fonksiyon *(f single function)*

Tek fonksiyonlar orijine göre simetriktir.
Single functions are symmetrical in relation to origin.

$$\int_{-a}^{a} f(x)\,dx = 0 \qquad a \in R$$

1.



$\Rightarrow S_1 + S_2 = ?$

18

2. $\displaystyle\int_{-4}^{4} |x|\,dx = ?$

16

3. $\displaystyle\int_{-1}^{1} (x^4 + x^2)\,dx = ?$

$\frac{16}{15}$

4. $\displaystyle\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x\,dx = ?$

2

5. $\displaystyle\int_{-3}^{3} (x^2 + 4)\,dx = ?$

42

6. $\displaystyle\int_{-2}^{2} (x^2 - 1)\,dx = ?$

$\frac{4}{3}$

1. $\displaystyle\int_{-9}^{9} (4x^5 - 7x^3 + 10x)\,dx = ?$

0

2. $\displaystyle\int_{-\frac{\pi}{6}}^{\frac{\pi}{6}} x \cdot \cos x\,dx = ?$

0

3. $\displaystyle\int_{-\pi}^{\pi} \sin^3 x\,dx = ?$

0

4. $\displaystyle\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} x^2 \cdot \tan x\,dx = ?$

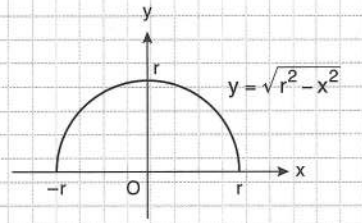
0

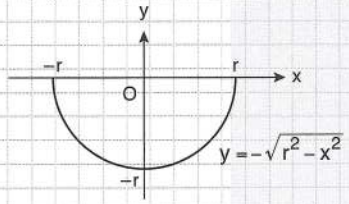
5. $\displaystyle\int_{-2}^{2} x^2 \cdot (x + 1)\,dx = ?$

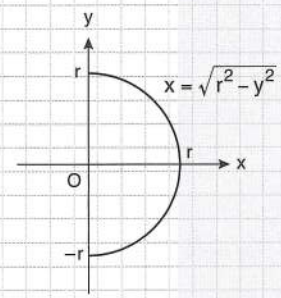
$\frac{16}{3}$

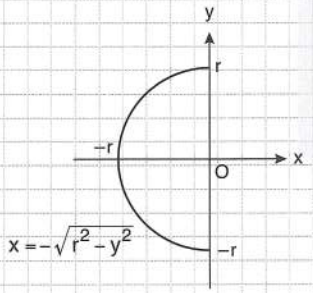
ÖZELLİK | Property 26

$x^2 + y^2 = r^2$

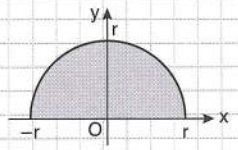




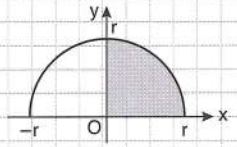




- $\displaystyle\int_{-r}^{r} \sqrt{r^2 - x^2}\,dx = \frac{\pi r^2}{2}$



- $\displaystyle\int_{0}^{r} \sqrt{r^2 - x^2}\,dx = \frac{\pi r^2}{4}$



1. $\displaystyle\int_{0}^{2} \sqrt{4 - x^2}\,dx = ?$

π

2. $\displaystyle\int_{-3}^{3} \sqrt{9 - x^2}\,dx = ?$

$\dfrac{9\pi}{2}$

3. $\displaystyle\int_{0}^{7} \sqrt{49 - x^2}\,dx = ?$

$\dfrac{49\pi}{4}$

4. $\displaystyle\int_{0}^{2\sqrt{2}} \sqrt{16 - x^2}\,dx = ?$

$2\pi + 4$

5. $\displaystyle\int_{0}^{\sqrt{2}} \sqrt{4 - x^2}\,dx = ?$

$\dfrac{\pi}{2} + 1$

6. $\displaystyle\int_{0}^{3} \left(\sqrt{36 - x^2} - \sqrt{3}\,x\right)dx = ?$

3π

1. $\int (2x)\,dx = ?$

A) $2x^2$ B) $2x^2 + c$ C) x^2 D) $x^2 + c$ E) $x + c$

2. $\int (x^2 + 4)\,dx = ?$

A) $x^3 + c$ B) $x^3 + 4x + c$ C) $\frac{x^3}{3} + 4x$ D) $\frac{x^3}{3} + 4x + c$ E) $2x^3 + 4x + c$

3. $\int \left(5x^4 - \frac{1}{x^2}\right)dx = ?$

A) $\frac{x^6 - 1}{x} + c$ B) $\frac{x^6 + 2}{x} + c$ C) $5x^4 - x^{-1} + c$ D) $x^5 + \frac{1}{x} + c$ E) $x^6 + x + c$

4. $\int (\sqrt[3]{x} + 2x)\,dx = ?$

A) $\frac{3}{4}\sqrt[3]{x^4} + x^2 + c$ B) $\frac{3}{4}\sqrt[3]{x} + 2x + c$ C) $x\sqrt[3]{x} + x^2 + c$ D) $\sqrt[3]{x^4} + 2x^2 + c$ E) $\frac{1}{3}\sqrt[3]{x} + x^2 + c$

5. $\int (\sqrt{x} + 3x^2)\,dx = ?$

A) $\frac{1}{2}\sqrt{x} + 6x + c$ B) $\frac{2}{3}\sqrt{x^3} + c$ C) $\frac{1}{2\sqrt{x}} + x^3 + c$ D) $\frac{1}{2\sqrt{x}} + 6x + c$ E) $\frac{2}{3}\sqrt{x^3} + x^3 + c$

6. $\int \left(\frac{1}{x}\right)dx = ?$

A) x^{-2} B) $-x^{-1} + c$ C) $x^{-2} + c$ D) $\ln|x| + c$ E) $x \cdot \ln|x| + c$

7. $\int \left(x^2 - \frac{1}{x}\right)dx = ?$

A) $x^3 - x^{-2} + c$ B) $\frac{x^3}{3} + x^{-2} + c$ C) $\frac{x^3}{3} - \ln|x| + c$ D) $\frac{x^3}{3} + \ln|x| + c$ E) $x^3 + \ln|x| + c$

8. $\int \left(\sqrt[3]{x} + \frac{1}{x} - x^2\right)dx = ?$

A) $\frac{1}{3}\sqrt[3]{x} - x^{-2} - 2x + c$ B) $\frac{3}{4}\sqrt[3]{x^4} + \ln|x| - x^3 + c$ C) $\frac{1}{3}\sqrt{x} - 2x + c$ D) $\frac{3}{4}\sqrt[3]{x^4} + \ln|x| - \frac{x^3}{3} + c$ E) $\frac{1}{3}\sqrt{x} - 2x - 2 + c$

9. $\int (\cos x)\,dx = ?$

A) $-\cos x + c$ B) $\cos x + c$ C) $\sin x + c$
D) $-\sin x + c$ E) $x \cdot \sin x + c$

10. $\int (\sin x)\,dx = ?$

A) $\sin x + c$ B) $-\sin x + c$ C) $\cos + c$
D) $-\cos x + c$ E) $x \cdot \cos x + c$

11. $\int e^x dx = ?$

A) e^x B) $e^x + c$ C) $e^{2x} + c$
D) $e^x + 1$ E) $x^2 + 1 + c$

12. $\int 3^x dx = ?$

A) $3^x + c$ B) $3^x \cdot \ln 3$ C) $\frac{3^x}{\ln 3} + c$
D) $3^x \cdot \ln 3 + c$ E) $\frac{1}{\ln 3} + c$

13. $\int (\cos x + x^2)\,dx = ?$

A) $\sin x + 2x + c$ B) $-\sin x - \frac{x^3}{3} + c$
C) $-\sin x + \frac{x^3}{3} + c$ D) $\sin x + \frac{x^3}{3} + c$
E) $\cos x - x^2 + c$

14. $\int (\sin x - \sqrt{x})\,dx = ?$

A) $\cos x - \frac{1}{\sqrt{x}} + c$ B) $-\cos x - \frac{2x\sqrt{x}}{3} + c$
C) $-\cos x - \frac{1}{2\sqrt{x}} + c$ D) $\sin x - \frac{1}{2}\sqrt{x} + c$
E) $\sin x - \frac{1}{2\sqrt{x}} + c$

15. $\int \left(\frac{1}{x} - 2^x\right) dx = ?$

A) $-\frac{x^{-2}}{2} - 2^x + c$ B) $\frac{x^{-2}}{2} - 2^x + c$
C) $\ln x - \frac{2^x}{\ln 2} + c$ D) $\ln x - 2^x + C$
E) $-x^{-1} - 2^x \cdot \ln 2 + c$

16. $\int \left(\frac{x^4 + x^2}{x^3}\right) dx = ?$

A) $\frac{x^3}{3} + \ln|x| + c$ B) $\frac{x^3}{3} + c$
C) $\frac{x^2}{2} + \ln|x| + c$ D) $x^3 + \frac{1}{x} + c$
E) $\frac{x^3}{3} + \ln\left|\frac{1}{x}\right| + c$

1. $\frac{d}{dx}\int (x^3+3)dx = ?$

A) $3x^2$ B) x^3 C) x^3+3 D) x^3+3x E) x^3-3x

2. $\int (3x^2-4x+1)dx = ?$

A) x^3-x^2+x+c B) x^3-2x^2+x+c C) x^3+2x^2-x+c D) x^3-2x^2+c E) $6x-4+c$

3. $\int d(x^2+3x) = ?$

A) $2x+3$ B) $2x+c$ C) x^2+3x D) x^2+3x+c E) x^2+c

4. $\int f(x)dx = 2x^3-7x^2+5x+11$

$\Rightarrow f(1) = ?$

A) -3 B) -2 C) -1 D) 0 E) 1

5. $\int \left(x^2+\frac{1}{x}\right)dx = ?$

A) $\frac{x^3}{3}+\ln|x|+c$ B) $\frac{x^3}{3}+c$ C) $\frac{x^3}{3}-\frac{1}{x^2}+c$ D) $2x+\frac{1}{x^2}+c$ E) $\frac{x^3}{3}+\ln\left|\frac{1}{x}\right|+c$

6. $\int (\sqrt[3]{x}+\sqrt{x})dx = ?$

A) $\sqrt[3]{x^4}+\sqrt{x^3}+c$ B) $\frac{3}{4}\sqrt[3]{x^4}+\frac{2}{3}\sqrt{x^3}+c$ C) $\frac{x^3}{3}-\frac{1}{x^2}+c$ D) $2x+\frac{1}{x^2}+c$ E) $\frac{x^3}{3}+\ln\left|\frac{1}{x}\right|+c$

7. $\int (x^2+2^x)dx = ?$

A) $\frac{x^3}{3}+2^x+c$ B) $\frac{x^3}{3}+\frac{2^{x+1}}{x+1}+c$ C) $\frac{x^3}{3}+2^x\cdot\ln 2+c$ D) $\frac{x^3}{3}+2^x\cdot\ln 3+c$ E) $\frac{x^3}{3}+\frac{2^x}{\ln 2}+c$

8. $\int (\cos x-\sin x)dx = ?$

A) $\sin x-\cos x+c$ B) $-\sin x-\cos x+c$ C) $-\sin x+\cos x+c$ D) $\sin^2 x-\cos^2 x+c$ E) $\sin x+\cos x+c$

9. $\int (e^x + 3)dx = ?$

A) $e^x + 3x + c$ B) $e^x + c$

C) $e^x - 3x^2 + c$ D) $\frac{e^{x+1}}{x+1} + c$

E) $\frac{e^{x+1}}{x+1} + 3x + c$

10. $f'(x) = 6x^2 - 8x + 5$

$\Rightarrow f(x) = ?$

A) $2x^3 - 2x^2 + 5x + c$ B) $2x^3 - 4x^2 + x + c$

C) $2x^3 - 4x^2 + 5x + c$ D) $3x^3 - 2x^2 + 5x + c$

E) $3x^3 - 4x^2 + 5x + c$

11. $\int \frac{x\sqrt{x}}{\sqrt[3]{x}} dx = ?$

A) $\frac{13}{6}x^{\frac{13}{6}} + c$ B) $x^{\frac{13}{6}} + c$ C) $\frac{6}{7}x^{\frac{7}{6}} + c$

D) $\frac{6}{13}x^{\frac{13}{6}} + c$ E) $x^{\frac{7}{6}} + c$

12. $\int \frac{dx}{(x-3)^2 + 6x - 8} = ?$

A) arcsinx + c B) cotx + c C) tanx + c

D) arccotx + c E) arctanx + c

13. $\int x^3 d(x^2) = ?$

A) $\frac{x^4}{4} + c$ B) $\frac{x^4}{2} + c$ C) $\frac{x^5}{5} + c$

D) $\frac{2x^5}{5} + c$ E) $\frac{x^4}{10} + c$

14. $f(x) = \int (2x + 5)dx$

$f(0) = 7$

$\Rightarrow f(2) = ?$

A) 20 B) 21 C) 22 D) 23 E) 24

15. $f(x) = \int g'(x)dx$

$f(2) - g(2) = 4$

$f(3) = 7$

$\Rightarrow g(3) = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

16. $\int \frac{x^3 + x + 1}{x^2} dx = ?$

A) $\frac{x^2}{2} + \ln|x| + \frac{1}{x} + c$ B) $\frac{x^2}{2} + \ln|x| + c$

C) $\frac{x^2}{2} + \frac{1}{x} + c$ D) $\frac{x^2}{2} - \frac{1}{x} + c$

E) $\frac{x^2}{2} + \ln|x| - \frac{1}{x} + c$

1. $f'(x) = 8x^3 - 6x + 5$
$\Rightarrow f(x) = ?$

A) $2x^4 - 3x^2 + 5 + c$
B) $2x^4 - 3x^2 + 5x + c$
C) $24x^2 - 6$
D) $24x^2 - 6 + c$
E) $2x^4 - 2x^2 + 5x + c$

2. $f'(x) = 6x^2 - \frac{2}{x}$
$\Rightarrow f(x) = ?$

A) $3x^2 - 2x^{-2} + c$
B) $x^3 - 2x + c$
C) $2x^3 - 2\ln|x| + c$
D) $2x^3 - 2x^{-1} + c$
E) $2x^3 + 2x + c$

3. $f(x) = \int (3x^2 + 6)dx$
$f(0) = 5$
$\Rightarrow f(1) = ?$

A) 5 B) 6 C) 10 D) 12 E) 15

4. $\int \left(\frac{x\sqrt{x}}{\sqrt[4]{x}}\right)dx = ?$

A) $\frac{14}{3}x^{\frac{13}{4}} + c$
B) $\frac{4}{9}x^{\frac{9}{4}} + c$
C) $\frac{4}{11}x^{\frac{11}{4}} + c$
D) $\frac{2}{3}x^{\frac{3}{2}} + c$
E) $\frac{1}{4}x^4 + c$

5. $\int \left(\frac{\sqrt{x}}{\sqrt[3]{x}}\right)dx = ?$

A) $\frac{1}{6}x^6 + c$
B) $\frac{5}{2}x^{\frac{2}{5}} + c$
C) $\frac{6}{7}x^{\frac{7}{6}} + c$
D) $\frac{7}{6}x^{\frac{6}{7}} + c$
E) $3x^{\frac{1}{3}} + c$

6. $\int \frac{(x-2)^2}{x}dx = ?$

A) $\frac{(x-2)^3}{3} + \ln|x| + c$
B) $(x-2)^2 + \ln|x| + c$
C) $x^2 - 4x + 4\ln|x| + c$
D) $\frac{(x-2)^3}{3} + c$
E) $\frac{x^2}{2} - 4x + 4\ln|x| + c$

7. $\int \left(\frac{x^2-4}{x+2}\right)dx = ?$

A) $\frac{x^2}{2} - 2x + c$
B) $\frac{x^2}{2} + 2x + c$
C) $x^2 - 4x + c$
D) $x^2 + 4x + c$
E) $x^2 + c$

8. $\int \left(\frac{x^2-4x+3}{x-1}\right)dx = ?$

A) $\frac{x^2}{2} + 3x + c$
B) $\frac{x^2}{2} - 3x + c$
C) $x^2 - x + c$
D) $x^2 + x + c$
E) $x^2 + c$

9. $\int \left(\frac{x^4+x^2}{x^4}\right)dx = ?$

A) $\frac{x^2-1}{x}+c$ B) $\frac{x^2+1}{x}+c$

C) $x^2+\ln|x|+c$ D) $x+\frac{1}{x}+c$

E) $x+\ln|x|+c$

10. $\int \frac{(x-1)^3}{x}dx = ?$

A) $x^3-3x+3-\frac{1}{x}+c$ B) $\frac{x^4}{4}-x^3+3x-\ln|x|+c$

C) $\frac{x^3}{3}-\frac{3x^2}{2}+3x-\ln|x|+c$ D) $\frac{(x-1)^4}{4}+\ln|x|+c$

E) $x^2+\ln|x|+c$

11. $\int \left(\frac{\sqrt{x}+\sqrt[3]{x^2}}{\sqrt{x}}\right)dx = ?$

A) $x+c$ B) $\frac{2}{3}\sqrt{x}+x+c$

C) $x^2+\frac{6}{7}\sqrt[6]{x^7}+c$ D) $\frac{6}{7}\sqrt[6]{x^7}+c$

E) $x+\frac{6}{7}\sqrt[6]{x^7}+c$

12. $\int (e^x+2^x)dx = ?$

A) e^x+2^x+c B) $e^x+2^x\cdot\ln 2+c$

C) $e^x+2^{x+1}+c$ D) $e^x+\frac{2^x}{\ln 2}+c$

E) $e^x+2^x\cdot\ln 2+c$

13. $\int \left(\frac{1}{1+x^2}\right)dx = ?$

A) arcsinx + c B) arccosx + c

C) arctanx + c D) arccotx + c

E) – arctanx + c

14. $\int \left(\frac{1}{\sqrt{1-x^2}}\right)dx = ?$

A) arcsinx + c B) arccosx + c

C) arctanx + c D) arccotx + c

E) –arccotx + c

15. $\int \left(\frac{1}{\cos^2 x}\right)dx = ?$

A) tanx + c B) arctanx + c

C) cotx + c D) – arccotx + c

E) arcsinx + c

16. $\int \left(-\frac{1}{\sin^2 x}\right)dx = ?$

A) tanx + c B) arctanx + c

C) cotx + c D) – arccotx + c

E) – cotx + c

1. $\int (3x-2)^4\,dx = ?$

A) $\frac{(3x-2)^5}{5}+c$ B) $\frac{(3x-2)^5}{3}+c$

C) $\frac{(3x-2)^5}{15}+c$ D) $\frac{(3x-2)^4}{4}+c$

E) $\frac{(3x-2)^4}{12}+c$

2. $\int \sqrt{x+2}\,dx = ?$

A) $\frac{3}{2}\sqrt{x+2}+c$ B) $\frac{2}{3}\sqrt{x+2}+c$

C) $\frac{2}{3\sqrt{x+2}}+c$ D) $\frac{3}{2}\sqrt{(x+2)^3}+c$

E) $\frac{2}{3}\sqrt{(x+2)^3}+c$

3. $\int \frac{1}{(4x-1)^2}\,dx = ?$

A) $-\frac{1}{4x-1}+c$ B) $-\frac{1}{4(4x-1)}+c$

C) $-\frac{4}{(4x-1)}+c$ D) $-\frac{1}{4(x-1)}+c$

E) $-4(4x-1)+c$

4. $\int (\cot x)\,dx = ?$

A) $\ln|\cos x|+c$ B) $\ln|\sin x|+c$ C) $\sin^2 x+c$

D) $\cos^2 x+c$ E) $-\ln|\sin x|+c$

5. $\int \frac{\ln x}{x}\,dx = ?$

A) $\frac{(\ln|x|)^2}{2}+c$ B) $2\ln|x|+c$

C) $(\ln|x|)^2+c$ D) $\ln|x|+c$

E) $\ln|\ln x|+c$

6. $\int e^{3x-2}\,dx = ?$

A) $e^{3x-2}+c$ B) $3e^{3x-2}+c$

C) $\frac{e^{3x-2}}{3}+c$ D) $\frac{e^{3x-2}}{\ln 3}+c$

E) $(\ln 3)\cdot e^{3x-2}+c$

7. $\int (e^{\cos x}\cdot \sin x)\,dx = ?$

A) $\frac{e^{\cos x}}{\sin x}+c$ B) $-e^{\cos x}+c$ C) $e^{\tan x}+c$

D) $e^{\cos x}+c$ E) $e^{\sin x}+c$

8. $\int (\sin x\cdot \cos x)\,dx = ?$

A) $\frac{\sin^2 x}{2}+c$ B) $\frac{\cos^2 x}{2}+c$

C) $\cos(2x)+c$ D) $\frac{\cos(2x)}{2}+c$

E) $\frac{\sin(2x)}{2}+c$

9. $\int \frac{\arctan x}{1+x^2}dx = ?$

A) $\arctan x + c$
B) $\frac{\arctan^2 x}{2} + c$
C) $\text{arccot} x + c$
D) $\frac{\text{arc}\cot^2 x}{2} + c$
E) $\arcsin x + c$

10. $\int (\cos^2 x \cdot \sin x)dx = ?$

A) $-\frac{\cos^3 x}{3} + c$
B) $\frac{\cos^3 x}{3} + c$
C) $\frac{\sin^3 x}{3} + c$
D) $-\frac{\sin^3 x}{3} + c$
E) $\frac{\sin(2x)}{3} + c$

11. $\int (\cos^3 x \cdot \sin^2 x)\, dx = ?$

A) $\frac{\sin^3 x}{3} - \frac{\sin^4 x}{4} + c$
B) $\frac{\sin^3 x}{3} - \frac{\cos^5 x}{5} + c$
C) $\frac{\sin^3 x}{3} - \frac{\sin^5 x}{5} + c$
D) $\frac{\cos^4 x}{4} - \frac{\sin^3 x}{3} + c$
E) $\frac{\cos^5 x}{5} - \frac{\sin^3 x}{3} + c$

12. $\int \frac{e^x}{e^x+3}dx = ?$

A) $\ln|e^x+3| + c$
B) $\ln\left|\frac{1}{e^x+3}\right| + c$
C) $x \cdot \ln 3 + c$
D) $\ln|e^x| + c$
E) $-\ln|e^x| + c$

13. $\int \frac{\sin(2x)}{1+\sin^2 x}dx = ?$

A) $\ln|\sin^2 x| + c$
B) $x + \ln|\sin^2 x| + c$
C) $\ln|\sin(2x)| + c$
D) $\ln|1+\sin^2 x| + c$
E) $\ln|1+\sin x| + c$

14. $\int \cos^2 x\, dx = ?$

A) $\frac{\cos^3 x}{3} + c$
B) $\frac{\sin^3 x}{3} + c$
C) $\frac{\sin(2x)}{2} + x + c$
D) $\frac{\sin(2x)}{4} + \frac{x}{2} + c$
E) $\frac{\cos(2x)}{4} + \frac{x}{2} + c$

15. $\int \frac{dx}{1+9x^2} = ?$

A) $\arctan(3x) + c$
B) $3\arctan(3x) + c$
C) $\frac{1}{3}\arctan(3x) + c$
D) $\frac{1}{9}\arctan(9x) + c$
E) $\frac{1}{9}\arctan(3x) + c$

16. $\int \frac{dx}{\sqrt{1-4x^2}} = ?$

A) $\frac{1}{2}\arccos(2x) + c$
B) $\arccos(2x) + c$
C) $2\arcsin(2x) + c$
D) $\arcsin(2x) + c$
E) $\frac{1}{2}\arcsin(2x) + c$

1. $\int (4^{x-1})dx = ?$

A) $4^{x-1} + c$
B) $4^{x-1} \cdot (x-1) + c$
C) $4^{x-1} \cdot \ln 4 + c$
D) $\frac{4^{x-1}}{\ln 4} + c$
E) $(x-1) \cdot \ln 4 + c$

2. $\int \left(e^{x+2} + \frac{1}{x}\right)dx = ?$

A) $e^{x+2} + |x| + c$
B) $e^{x+2} - \frac{x^{-2}}{2} + c$
C) $(x+2) + \frac{x^{-2}}{2} + c$
D) $(x+2) - x^{-1} + c$
E) $e^{x+2} + \ln|x| + c$

3. $\int (e^{2x} - 6)dx = ?$

A) $\frac{e^{2x}}{2} - 6x + c$
B) $\frac{e^{2x}}{2} - 6 + c$
C) $\frac{e^{2x}}{2} + 6x + c$
D) $e^{2x} - 6x + c$
E) $2e^{2x} - 6x + c$

4. $\int (2x-1)^3 dx = ?$

A) $\frac{(2x-1)^4}{4} + c$
B) $\frac{(2x-1)^4}{2} + c$
C) $\frac{(2x-1)^4}{8} + c$
D) $6(2x-1)^2 + c$
E) $2(2x-1)^4 + c$

5. $\int \frac{1}{(x-1)^2} dx = ?$

A) $-\frac{1}{(x-1)} + c$
B) $-\frac{2}{(x-1)^2} + c$
C) $-\frac{3}{(x-1)^3} + c$
D) $-\frac{1}{3(x-1)^3} + c$
E) $(1-x) + c$

6. $\int (\tan x)dx = ?$

A) $\ln|\sec x| + c$
B) $\ln|\sin x| + c$
C) $\sin^2 x + c$
D) $\ln|\cos x| + c$
E) $-\ln|\sin x| + c$

7. $\int (\sin^2 x \cdot \cos x)dx = ?$

A) $\frac{\sin^2 x}{2} + c$
B) $\frac{\sin^3 x}{3} + c$
C) $\sin x + c$
D) $\frac{\cos^2 x}{2} + c$
E) $-\frac{\cos^2 x}{2} + c$

8. $\int \frac{\ln^2 x}{x} dx = ?$

A) $\ln|x| + c$
B) $\frac{\ln^2|x|}{2} + c$
C) $\frac{\ln^3|x|}{3} + c$
D) $\ln|x| \cdot x + c$
E) $\ln^2|x| \cdot x + c$

9. $\int \left(e^{5x+1}\right)dx = ?$

A) $e^{5x+1} + c$
B) $5e^{5x+1} + c$
C) $e^{5x} + c$
D) $\frac{e^{5x+1}}{5} + c$
E) $e^{5x+1} \cdot \ln 5 + c$

10. $\int (2x-2)\cdot(x^2-2x)\,dx = ?$

A) $x^2 - 2x + c$
B) $\frac{(x^2-2x)^2}{2} + c$
C) $\frac{x^2-2x}{2} + c$
D) $\frac{(2x-1)^2}{2} + c$
E) $x^3 - x^2 + c$

11. $\int \frac{x^2-1}{x^3-3x}\,dx = ?$

A) $\frac{1}{x^3-3x} - \frac{1}{x^2-1} + c$
B) $\frac{\ln|x^3-3x|}{3} + c$
C) $3\ln|x^3-3x| + c$
D) $\ln|x^3-3x| + c$
E) $2x^2 - 3 + c$

12. $\int \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx = ?$

A) $e^{\sqrt{x}} + c$
B) $\sqrt{x}\,e^{\sqrt{x}} + c$
C) $\sqrt{x} + c$
D) $\frac{1}{2}e^{\sqrt{x}} + c$
E) $2e^{\sqrt{x}} + c$

13. $\int x(x^2-1)^4\,dx = ?$

A) $\frac{(x^2-1)^5}{10} + c$
B) $\frac{(x^2-1)^5}{5} + c$
C) $(x^2-1)^5 + c$
D) $\frac{(x^2-1)^4}{4} + 2 + c$
E) $(x^2-1)^5 + 2x + c$

14. $\int \left(\cos^3 x\right)dx = ?$

A) $\frac{\sin^3 x}{3} + c$
B) $\frac{\cos^4 x}{4} + c$
C) $\sin x - \frac{\sin^3 x}{3} + c$
D) $x - \sin^2 x + c$
E) $\frac{\cos^2 x}{2} + c$

15. $\int \left(\sin^3 x\right)dx = ?$

A) $-\frac{\cos^3 x}{3} + c$
B) $-\frac{\sin^4 x}{4} + c$
C) $\cos x + \frac{\cos^3 x}{3} + c$
D) $\frac{\cos^3 x}{3} - \cos x + c$
E) $\sin^2 x + c$

16. $\int (\sin x \cdot \cos x)\,dx = ?$

A) $\frac{\sin^2 x}{2} - \frac{\sin^4 x}{4} + c$
B) $\frac{\sin^2 x}{2} + c$
C) $\frac{\cos^2 x}{2} + c$
D) $\frac{\cos^2 x}{2} - \frac{\cos^4 x}{4} + c$
E) $\cos^2 x + x + c$

1. $\int (1+\tan^2 x)\,dx = ?$

A) $\arcsin x + c$
B) $\arccos x + c$
C) $\tan x + c$
D) $\arctan x + c$
E) $\cot x + c$

2. $\int -(1+\cot^2 x)\,dx = ?$

A) $\arcsin x$
B) $\arccos x + c$
C) $\tan x + c$
D) $\operatorname{arccot} x + c$
E) $\cot x + c$

3. $\int \frac{1}{\cos^2(2x+1)}\,dx = ?$

A) $\tan(2x+1) + c$
B) $\frac{1}{2}\tan(2x+1) + c$
C) $-\cot(2x+1) + c$
D) $-\frac{1}{2}\cot(2x+1) + c$
E) $2\cdot\tan(2x+1) + c$

4. $\int \left(\frac{1}{(x-2)^2+4x-3}\right)dx = ?$

A) $\arcsin x + c$
B) $\cot x + c$
C) $\tan x + c$
D) $\operatorname{arccot} x + c$
E) $\arctan x + c$

5. $\int \frac{(\arctan x)^3}{1+x^2}\,dx = ?$

A) $(\arctan x)^4 + c$
B) $(\arctan x)^3 + c$
C) $\frac{1}{4}(\arctan x)^4 + c$
D) $-\frac{1}{4}(\arctan x)^4 + c$
E) $\frac{1}{2}(\arctan x)^2 + c$

6. $\int \frac{dx}{\tan x \cdot \ln(\sin x)} = ?$

A) $\ln|\sin x| + c$
B) $\ln|\ln|\sin x||+c$
C) $\ln|\cos x| + c$
D) $\ln|\tan x| + c$
E) $\ln|\cot x| + c$

7. $\int \frac{2}{x}\cdot\sin(\ln x)\cdot dx = ?$

A) $\cos x + c$
B) $2\cdot\cos x + c$
C) $2\cdot\cos(\ln x) + c$
D) $-2\cdot\cos(\ln x) + c$
E) $-2\cdot\sin(\ln x) + c$

8. $\int \frac{9}{9+4x^2}\,dx = ?$

A) $\arcsin x + c$
B) $\arcsin\left(\frac{2x}{3}\right) + c$
C) $\frac{3}{2}\cdot\arctan\left(\frac{2x}{3}\right) + c$
D) $\frac{2}{3}\cdot\arctan\left(\frac{2x}{3}\right) + c$
E) $\frac{3}{2}\cdot\arcsin\left(\frac{2x}{3}\right) + c$

9. $\int \frac{-4}{4+4x^2}dx = ?$

A) $\arctan x + c$
B) $\text{arccot} x + c$
C) $-\text{arccot} x + c$
D) $\arcsin x + c$
E) $-\arcsin x + c$

10. $\int \frac{1}{\sqrt{4-36x^2}}dx = ?$

A) $\frac{1}{2}\arcsin(3x) + c$
B) $\frac{3}{2}\arcsin(3x) + c$
C) $\frac{1}{6}\arcsin(3x) + c$
D) $\frac{3}{2}\arccos(3x) + c$
E) $\frac{1}{6}\arccos(3x) + c$

11. $\int \frac{2}{\sqrt{16-4x^2}}dx = ?$

A) $\arctan\left(\frac{x}{2}\right) + c$
B) $\arcsin\left(\frac{x}{2}\right) + c$
C) $\frac{1}{2}\arcsin\left(\frac{x}{2}\right) + c$
D) $\arctan x + c$
E) $-\sin\left(\frac{x}{2}\right) + c$

12. $\int \frac{-4}{\sqrt{16-16x^2}}dx = ?$

A) $\arcsin x + c$
B) $\arccos x + c$
C) $-\arctan x + c$
D) $\text{arccot} x + c$
E) $-\text{arccot} x + c$

13. $\int \arctan(\cot x)\,dx = ?$

A) $-\arctan x + c$
B) $\text{arccot} x + c$
C) $-\frac{\arctan^2(\cot x)}{2} + c$
D) $\frac{\arctan^2(\cot x)}{2} + c$
E) $\frac{\arcsin^2 x}{2} + c$

14. $\int \left(\frac{e^x}{2e^x-1}\right)dx = ?$

A) $\ln|2e^x - 1| + c$
B) $2\ln|2e^x - 1| + c$
C) $\frac{\ln|2e^x-1|}{2} + c$
D) $\frac{(2e^2-1)^2}{2} + c$
E) $-\frac{2}{(2e^x-1)} + c$

15. $\int \frac{\sin(4x)}{\sqrt{1+\sin^2(2x)}}dx = ?$

A) $2\sqrt{1+\sin^2(2x)} + c$
B) $4\sqrt{1+\sin^2(2x)} + c$
C) $\sqrt{1+\sin^2(2x)} + c$
D) $\frac{1}{2}\sqrt{1+\sin^2(2x)} + c$
E) $\frac{1}{4}\sqrt{1+\sin^2(2x)} + c$

16. $\int \frac{dx}{2x+\ln x^{2x}} = ?$

A) $\ln x + c$
B) $\ln|1 - \ln x| + c$
C) $2\ln|1 + \ln x| + c$
D) $\ln|1 + \ln x| + c$
E) $\frac{\ln|1+\ln x|}{2} + c$

1. $\int \frac{1}{\cos^2(5x)}dx = ?$

A) $\tan(5x) + c$
B) $\cot(5x) + c$
C) $\frac{\tan(5x)}{5} + c$
D) $\frac{\cot(5x)}{5} + c$
E) $-\frac{\tan(5x)}{5} + c$

2. $\int (P(x) \cdot P'(x))dx = ?$

A) $P(x) + c$
B) $\frac{P^2(x)}{2} + c$
C) $\frac{P(x)}{P'(x)} + c$
D) $P'(x) + c$
E) $\frac{[P'(x)]^2}{2} + c$

3. $\int \frac{3^{\sqrt{x}}}{2\sqrt{x}}dx = ?$

A) $3^{\sqrt{x}} + c$
B) $3^{\sqrt{x}} \cdot \ln 3 + c$
C) $\frac{3^{\sqrt{x}}}{\ln\sqrt{x}} + c$
D) $\frac{3^{\sqrt{x}}}{\ln 3} + c$
E) $3^{\sqrt{x}} \cdot \log 3 + c$

4. $\int \frac{e^x dx}{1 + e^{2x}} = ?$

A) $\ln|e^{2x} + 1| + c$
B) $\arctan(e^x) + c$
C) $2x + c$
D) $\frac{\arctan(e^x)}{2} + c$
E) $\text{arccot}(e^x) + c$

5. $\int (\tan^3 x \cdot \sec^2 x\, dx) = ?$

A) $\frac{\cos^{-4}x}{4} + c$
B) $\frac{\sin^{-4}x}{4} + c$
C) $\frac{\cot^4 x}{4} + c$
D) $\frac{\tan^4 x}{4} + c$
E) $\frac{\cot^2 x}{2} + c$

6. $\int \frac{1}{x^2 + 6x + 10}dx = ?$

A) $\text{arccot}(x + 3) + c$
B) $-\frac{1}{(x+3)} + c$
C) $\frac{1}{x+3} + c$
D) $\arctan(x + 3) + c$
E) $\arctan(x + 3)^2 + c$

7. $\int x(x+1)^3 dx = ?$

A) $\frac{(x+1)^5}{5} - \frac{(x+1)^4}{4} + c$
B) $\frac{(x+1)^5}{5} - \frac{(x+1)^3}{3} + c$
C) $\frac{x^5}{5} - \frac{x^3}{3} + c$
D) $\frac{(x+1)^5}{5} + \frac{(x+1)^3}{3} + c$
E) $\frac{x^5}{5} + \frac{x^3}{3} + c$

8. $\int \frac{1 + \cos(2x)}{\sin(2x)}dx = ?$

A) $\ln|\sin(2x)| + c$
B) $-\ln|\cos(2x)| + c$
C) $\cot x + c$
D) $\ln|\cos x| + c$
E) $\ln|\sin x| + c$

9. $\int f'(5x+7)\,dx = ?$

A) $f(5x+7)+c$
B) $5\cdot f(5x+7)+c$
C) $f(5)+c$
D) $\frac{x^2}{2}+\ln|x|+\frac{1}{x}+c$
E) $\frac{1}{5}\cdot f(5x+7)+c$

10. $A=\int \frac{e^{2x}+1}{e^x-1}dx$

$u=e^x$

$\Rightarrow A=?$

A) $\int \frac{u^2+1}{u-1}du$
B) $\int \frac{u^3+u}{u-1}du$
C) $\int \frac{u^3+u}{u^2-1}du$
D) $\int \frac{u^2+1}{u^2-1}du$
E) $\int \frac{u^2+1}{u^2-u}du$

11. $A=\int \frac{\sqrt[3]{x+1}+\sqrt{x+1}}{x+1}dx$

$u=\sqrt[6]{x+1}$

$\Rightarrow A=?$

A) $\int\left(\frac{1}{u^4}+\frac{1}{u^3}\right)du$
B) $\int(u^2+u^3)du$
C) $6\int(u+u^2)du$
D) $\int(u+u^2)du$
E) $\int\left(\frac{1}{u+u^2}\right)du$

12. $A=\int \frac{1}{9+x^2}dx$

$x=3\cdot\tan t$

$\Rightarrow A=?$

A) $\frac{1}{3}\int dt$
B) $\int dt$
C) $3\int dt$
D) $9\int dt$
E) $\frac{1}{9}\int dt$

13. $A=\int \frac{1}{\cos^4 x}dx \qquad u=\tan x$

$\Rightarrow A=?$

A) $\int(u^2+1)du$
B) $\int \frac{1}{u^2+1}du$
C) $\int(u^2-1)du$
D) $\int \frac{1}{u^4+u}du$
E) $\int(u^4+1)du$

14. $0\le t<\frac{\pi}{2}$

$A=\int\sqrt{4-x^2}\,dx \qquad x=2\sin t$

$\Rightarrow A=?$

A) $4\int(\cos^2 t)dt$
B) $-4\int(\cos^2 t)dt$
C) $4\int(\sin^2 t)dt$
D) $\int(\sin^2 t)dt$
E) $\int(\cos t)dt$

15. $\int(x^3+x)d(x^2)=?$

A) $\frac{x^5}{5}+\frac{x^3}{3}+c$
B) $\frac{x^6}{6}+\frac{x^4}{4}+c$
C) $\frac{x^6}{3}+\frac{x^4}{2}+c$
D) $\frac{2x^5}{5}+\frac{2x^3}{3}+c$
E) $\frac{x^4}{4}+\frac{x^2}{2}+c$

16. $0\le x\le\frac{\pi}{2}$

$\Rightarrow \int\sqrt{1-\cos x}\,dx=?$

A) $\sqrt{2}\cdot\cos\left(\frac{x}{2}\right)+c$
B) $-\sqrt{2}\cdot\cos\left(\frac{x}{2}\right)+c$
C) $-2\sqrt{2}\cdot\cos\left(\frac{x}{2}\right)+c$
D) $-\frac{\sqrt{2}}{2}\cdot\cos x+c$
E) $\frac{\sqrt{2}}{2}\cdot\cos x+c$

1. $\int \frac{x^2-x}{x}dx = ?$

A) $x + \ln|x| + c$
B) $x - \ln|x| + c$
C) $\frac{x^2}{2} + x + c$
D) $\frac{x^2}{2} - x + c$
E) $\ln|x^2 - x| - x + c$

2. $\int \frac{x+2}{x+1}dx = ?$

A) $x - \ln|x+1| + c$
B) $1 + x + c$
C) $x + \ln|x+1| + c$
D) $\ln\left|\frac{x+2}{x+1}\right| + c$
E) $x^2 - 2x + c$

3. $\int \frac{x^2-1}{x+1}dx = ?$

A) $\frac{x^2}{2} - x + c$
B) $x - 1 + c$
C) $\frac{x^2}{2} + x + c$
D) $x + 1 + c$
E) $\ln|x^2 - 1| + c$

4. $\int \frac{3x-7}{x-3}dx = ?$

A) $3x + \ln|x-3| + c$
B) $3x + 2\cdot\ln|x-3| + c$
D) $x + 2\ln|x-3| + c$
D) $\ln|x-3| + x + c$
E) $\ln|x+3| + c$

5. $\int \frac{x^2+2x+3}{x+2}dx = ?$

A) $\frac{x^3}{3} - \frac{x^2}{2} + x + c$
B) $\frac{x^2}{2} - \frac{\ln|x+2|}{2} + c$
C) $x - \ln|x+2| + c$
D) $\frac{x^2}{2} - \ln|x+2| + c$
E) $\frac{x^2}{2} + 3\cdot\ln|x+2| + c$

6. $\int \frac{x^3+x^2-3}{x+1}dx = ?$

A) $3\cdot\ln|x^3+x^2+3| + c$
B) $x^3 - \ln|x+1| + c$
C) $\frac{x^3}{3} - 3\cdot\ln|x+1| + c$
D) $\frac{x^2}{2} - 2\cdot\ln|x+1| + c$
E) $\frac{x^3}{3} + 2\cdot|\ln x + 1| + c$

7. $\int \frac{x^3+x-1}{x^2+1}dx = ?$

A) $\ln|x^2+1|\cdot x + c$
B) $\frac{x^3}{3} - \frac{x^2}{2} + c$
C) $\frac{x^2}{2} - \arctan x + c$
D) $x - \arctan x + c$
E) $\frac{x^2}{2} - \arcsin x + c$

8. $\int \left(\frac{x-1}{x-2}\right)dx = ?$

A) $x + \ln|x-2| + c$
B) $x - \ln|x-2| + c$
C) $\frac{x^2}{2} - \ln|x-2| + c$
D) $\ln|x-2| + c$
E) $\ln\left|\frac{x-1}{x-2}\right| + c$

9. $\int \frac{5}{(x-2)(x+3)}dx = ?$

A) $5 \cdot \ln\left|\frac{x-2}{x+3}\right| + c$
B) $\frac{1}{5}\ln\left|\frac{x-2}{x+3}\right| + c$
C) $5 \cdot \ln\left|\frac{x+3}{x-2}\right| + c$
D) $\frac{1}{5}\ln\left|\frac{x+3}{x-2}\right| + c$
E) $\ln\left|\frac{x-2}{x+3}\right| + c$

10. $\int \frac{dx}{(x+1)(x+2)} = ?$

A) $\ln\left|\frac{x+2}{x+1}\right| + c$
B) $\ln\left|\frac{x+1}{x+2}\right| + c$
C) $\ln|(x+1)(x+2)| + c$
D) $2 \cdot \ln\left|\frac{x+1}{x+2}\right| + c$
E) $\frac{1}{2}\ln\left|\frac{x+2}{x+1}\right| + c$

11. $\int \frac{2x}{(x^2+1)(x^2+2x+1)}dx = ?$

A) $\arcsin x + \frac{1}{1-x} + c$
B) $\arcsin x - \frac{1}{1-x} + c$
C) $\operatorname{arccot} x - \frac{1}{1-x} + c$
D) $\arctan x + \frac{1}{x+1} + c$
E) $\ln|x^2 + 2x + 1| + c$

12. $\int \frac{1+\sin(2x)}{\sin x + \cos x}dx = ?$

A) $-\cos x + \sin x + c$
B) $\cos x - \sin x + c$
C) $\ln\left|\frac{\cos x}{\sin x}\right| + c$
D) $\ln|\sin(2x)| + c$
E) $\frac{(1+\sin^2 x)^2}{2} + c$

13. $\int \frac{2x-1}{(x^2+1)(x+2)}dx = ?$

A) $\frac{1}{2}\ln|1+x^2| - \ln|x+2| + c$
B) $\ln\left|\frac{1+x^2}{x+2}\right| + c$
C) $\ln|(1+x^2)(x+2)| + c$
D) $2 \cdot \ln|(x+2)(x^2+1)| + c$
E) $\arctan x + \ln|x+2| + c$

14. $\int \frac{e^{2x}-1}{e^x+1}dx = ?$

A) $e^x + e^{-x} + c$
B) $e^{2x} + e^x + c$
C) $e^x + x + c$
D) $e^x - x + c$
E) $e^x + c$

15. $\int \frac{2x+1}{x^2+1}dx = ?$

A) $\arctan x + c$
B) $\arctan x + \ln|x+1| + c$
C) $\arctan x + \ln|1+x^2| + c$
D) $\arcsin x + \ln|1+x^2| + c$
E) $\arcsin x + \ln|1-x^2| + c$

16. $\int \frac{x-1}{x^2+1}dx = ?$

A) $\ln|x+1| + c$
B) $x + \ln|x+1| + c$
C) $\ln\left|\frac{x+1}{x-1}\right| + c$
D) $\frac{1}{2}\ln|1+x^2| + \arctan x + c$
E) $\frac{1}{2}\ln|1+x^2| + \operatorname{arccot} x + c$

1. $\int \frac{x^3-2x^2+1}{x}dx = ?$

A) $x^2-2x+\frac{1}{x}+c$
B) $\frac{x^3}{3}-x^2+\ln|x|+c$
C) $\frac{x^3}{3}-x^2+\frac{1}{x}+c$
D) $x^3-x^2+\ln|x|+c$
E) $\frac{x^3}{3}-x^2-\frac{1}{x^2}+c$

2. $\int \frac{x+3}{x+2}dx = ?$

A) $x+\ln|x+2|+c$
B) $1+\ln|x+2|+c$
C) $x+\frac{1}{x+2}+c$
D) $1+\frac{1}{x+2}+c$
E) $x+\ln|x+3|+c$

3. $\int \frac{3x+4}{x-2}dx = ?$

A) $3+\frac{10}{x-2}+c$
B) $3x+\ln|x-2|+c$
C) $3+\ln|x-2|+c$
D) $3x+\ln|3x+4|+c$
E) $3x+10\cdot\ln|x-2|+c$

4. $\int \frac{x^2+2}{x^2+1}dx = ?$

A) $1 + \arctan x + c$
B) $\ln|x^2+1|+c$
C) $x + \arctan x + c$
D) $\frac{x^2}{2}+\arctan x+c$
E) $x + 2\arctan x + c$

5. $\int \frac{x^2-2x+3}{x+1}dx = ?$

A) $\frac{x^2}{2}-3x+c$
B) $x-3+6\ln|x+1|+c$
C) $\frac{x^2}{2}-3x+\ln|x+1|+c$
D) $\frac{x^2}{2}-3x+6\ln|x+1|+c$
E) $x^2-3x+\ln|x+1|+c$

6. $\int \frac{x^3}{x+2}dx = ?$

A) $\frac{x^3}{3}-x^2+x+\ln|x+2|+c$
B) $x^3-2x-8\ln|x+2|+c$
C) $\frac{x^3}{3}-x^2+4x+c$
D) $x^3-x^2+4x+\ln|x+2|+c$
E) $\frac{x^3}{3}-x^2+4x-8\ln|x+2|+c$

7. $\int \frac{x^3}{x^2+1}dx = ?$

A) $x-\frac{x}{x^2+1}+c$
B) $\frac{x^2}{2}-\ln|x^2+1|+c$
C) $\frac{x^2}{2}-\arctan x+c$
D) $\frac{x^2}{2}-\frac{\ln|x^2+1|}{2}+c$
E) $\frac{x^3}{3}-\frac{x^2}{2}+x-\arctan x+c$

8. $\int \frac{dx}{x^2-9} = ?$

A) $\frac{1}{6}\ln\left|\frac{x+3}{x-3}\right|+c$
B) $\ln\left|\frac{x+3}{x+2}\right|+c$
C) $6\ln\left|\frac{x-3}{x+3}\right|+c$
D) $\frac{1}{6}\ln\left|\frac{x-3}{x+3}\right|+c$
E) $\frac{1}{9}\ln\left|\frac{x+3}{x-3}\right|+c$

9. $\int \frac{dx}{(x+2)(x+3)} = ?$

A) $\ln\left|\frac{x+3}{x+2}\right| + c$
B) $\ln\left|\frac{x+2}{x+3}\right| + c$
C) $2 \cdot \ln\left|\frac{x+3}{x+2}\right| + c$
D) $2 \cdot \ln\left|\frac{x+2}{x+3}\right| + c$
E) $\frac{1}{2}\ln\left|\frac{x+2}{x+3}\right| + c$

10. $\int \frac{dx}{9x^2-4} = ?$

A) $\frac{1}{4}\ln\left|\frac{3x-2}{3x+2}\right| + c$
B) $4 \cdot \ln\left|\frac{3x-2}{3x+2}\right| + c$
C) $\frac{4}{3}\ln\left|\frac{3x-2}{3x+2}\right| + c$
D) $\frac{1}{12}\ln\left|\frac{3x-2}{3x+2}\right| + c$
E) $\frac{3}{4}\ln\left|\frac{3x-2}{3x+2}\right| + c$

11. $\int \frac{5x+7}{x^2+3x+2}dx = ?$

A) $\ln|x^2+3x+2| + c$
B) $2 \cdot \ln|x^2+3x+2| + c$
C) $\ln\left|\frac{x+1}{x+2}\right| + c$
D) $\ln\left|\frac{x+2}{x+1}\right| + c$
E) $2 \cdot \ln|x+1| + 3 \cdot \ln|x+2| + c$

12. $\int \frac{x^2+x+2}{(x^2+1)(x+1)}dx = ?$

A) $2\arctan x + \ln|x+1| + c$
B) $\arctan x + \ln|x+1| + c$
C) $\arctan x + 2\ln|x| + c$
D) $\arctan x + \ln|x| + c$
E) $\arctan x + \frac{1}{x+1} + c$

13. $\int \frac{e^{2x}+1}{e^x}dx = ?$

A) $e^x + e^{-x} + c$
B) $e^x - e^{-x} + c$
C) $e^x + x + c$
D) $xe^x + c$
E) $x + e^{-x} + c$

14. $\int \frac{x+\sqrt{x}}{\sqrt[3]{x}}dx = ?$

A) $\sqrt[3]{x^2} + \sqrt[6]{x} + c$
B) $\sqrt[3]{x^5} + \sqrt[6]{x^7} + c$
C) $\frac{5}{3}\sqrt[3]{x^5} + \frac{7}{6}\sqrt[6]{x^7} + c$
D) $\frac{3}{5}\sqrt[3]{x^5} + \frac{6}{7}\sqrt[6]{x^7} + c$
E) $\frac{3}{5}\sqrt[3]{x^2} + \frac{6}{7}\sqrt[6]{x} + c$

15. $\int \frac{\cos(2x)}{\cos x - \sin x}dx = ?$

A) $\sin x + \cos x + c$
B) $\sin x - \cos x + c$
C) $-\sin x + \cos x + c$
D) $-\sin x - \cos x + c$
E) $\ln|\cos x - \sin x| + c$

16. $\int \frac{e^{3x}-e^x}{e^x-1}dx = ?$

A) $e^{2x} + e^x + c$
B) $e^{2x} - e^x + c$
C) $\frac{e^{2x}}{2} - e^x + c$
D) $\frac{e^{3x}}{3} + e^x + c$
E) $\frac{e^{2x}}{2} + e^x + c$

1. $u = f(x)$
$v = g(x)$
$(uv)' = u'v + v'u$
Aşağıdakilerden hangisi doğrudur?
Which of the following is correct?

A) $\int udv = uv + \int vdu$

B) $\int udv = uv - \int vdu$

C) $uv = \int udu + \int vdv$

D) $\frac{v}{u} = \int udv + \int vdu$

E) $\frac{u}{v} = \int udv + \int vdu$

2. $\int (xe^x)dx = ?$

A) $xe^x + e^x + c$
B) $xe^{-x} + e^{-x} + c$
C) $xe^x - e^x + c$
D) $xe^{-x} - e^{-x} + c$
E) $x^2e^x + e^x + c$

3. $\int (x \cdot \sin x)dx = ?$

A) $x \cdot \cos x - \sin x + c$
B) $-x \cdot \cos x - \sin x + c$
C) $x \cdot \cos x + \sin x + c$
D) $-x \cdot \cos x + \cos x + c$
E) $-x \cdot \cos x + \sin x + c$

4. $\int (\ln x)dx = ?$

A) $x \cdot \ln|x| + x + c$
B) $x \cdot \ln|x| - 2x + c$
C) $x \cdot \ln|x| + 2x + c$
D) $\ln|x| + x + c$
E) $x \cdot \ln|x| - x + c$

5. $\int (x \cdot \ln x)dx = ?$

A) $x\ln x - \frac{x^2}{4} + c$
B) $x\ln x - \frac{x^2}{2} + c$
C) $\frac{x^2}{2}\ln x - \frac{x^2}{2} + c$
D) $\frac{x^2}{2}\ln x + \frac{x^2}{4} + c$
E) $\frac{x^2}{2}\ln x - \frac{x^2}{4} + c$

6. $\int (x^2 \cdot e^x)dx = ?$

A) $e^x \cdot (x^2 - 2x + 2) + c$
B) $e^x \cdot (x^2 + 2x + 2) + c$
C) $e^x \cdot (x^2 - 2x + 1) + c$
D) $e^x \cdot (x^2 - 2x - 2) + c$
E) $e^x \cdot (x^2 + x + 1) + c$

7. $\int (x^3 \sin x)dx = ?$

A) $-x^3 \cdot \cos x + 3x^2 \cdot \sin x + c$
B) $6x \cdot \cos x - 6 \cdot \sin x + c$
C) $-x^3 \cdot \cos x + 6 \cdot x\cos x + c$
D) $3x^2 \cdot \sin x - 6 \cdot \sin x + c$
E) $-x^3 \cdot \cos x + 3x^2 \cdot \sin x + 6x \cdot \cos x - 6 \cdot \sin x + c$

8. $\int \ln(3x+2)dx = ?$

A) $x \cdot \ln|3x+2| + c$

B) $\frac{x \cdot \ln|3x+2|}{3} + c$

C) $\frac{x \cdot \ln|3x+2|}{3} + 3x + c$

D) $(3x+2) \cdot \ln|3x+2| + c$

E) $\frac{3x+2}{3} \cdot \ln|3x+2| - x + c$

9. $\int (x \cdot e^{-x})dx = ?$

A) $e^{-x} \cdot (x+1) + c$
B) $-e^{-x} \cdot (x+1) + c$
C) $e^{x} \cdot (x+1) + c$
D) $e^{-x} \cdot (x-1) + c$
E) $e^{-x} \cdot (x^2-1) + c$

10. $\int (x^3 \cdot \ln x)dx = ?$

A) $\frac{x^4}{4}\left(\ln x - \frac{1}{2}\right) + c$
B) $\frac{x^4}{4}(x\ln x + x) + c$
C) $\frac{x^4}{4}\left(\ln x + \frac{x}{4}\right) + c$
D) $\frac{x^4}{4}\left(\ln x - \frac{1}{4}\right) + c$
E) $\frac{x^4}{4}\left(\ln x - \frac{x^4}{4}\right) + c$

11. $\int 2 \cdot \ln(x^x)dx = ?$

A) $2x \cdot (\ln x - 1) + c$
B) $\frac{x^2 \cdot \ln(x^2+1)}{2} + c$
C) $x^2 \cdot \ln|x| + c$
D) $\frac{x^2 \ln|x|}{2} + c$
E) $x^2 \cdot \ln|x| - \frac{x^2}{2} + c$

12. $\int \left((x^2-1) \cdot \cos x\right) \cdot dx = ?$

A) $(x^2-3) \cdot \sin x + 2x \cdot \cos x + c$
B) $(x^2-5) \cdot \sin x + 2x \cdot \cos x + c$
C) $x^2 \cdot \cos x - \sin x + c$
D) $\cos x - x^2 \cdot \sin x + c$
E) $x^2 - 4 \cdot \sin x + c$

13. $\int (e^x \cdot x)^2 dx = ?$

A) $e^{2x}\left(\frac{x^2}{2} - \frac{x}{2} + \frac{1}{4}\right) + c$
B) $e^{2x}\left(\frac{x^2}{2} - \frac{x}{4} + \frac{1}{8}\right) + c$
C) $e^{2x}\left(\frac{x^2}{2} + \frac{x}{4} + \frac{1}{8}\right) + c$
D) $e^{2x}\left(\frac{x^2}{2} + \frac{x}{2} + \frac{1}{4}\right) + c$
E) $e^{x}\left(\frac{x^2}{2} + \frac{x}{4} + \frac{1}{2}\right) + c$

14. $\int (\arcsin x)dx = ?$

A) $x\arcsin x - \frac{1}{2}\ln\left|\sqrt{1-x^2}\right| + c$
B) $x\arcsin x + \ln\left|\sqrt{1-x^2}\right| + c$
C) $x\arcsin x + \frac{1}{2}\ln\left|1-x^2\right| + c$
D) $x\arcsin x + \sqrt{1-x^2} + c$
E) $x\arcsin x - \sqrt{1-x^2} + c$

15. $\int (\log_3 x)dx = ?$

A) $x \cdot \log_3 x - x + c$
B) $\log_3(\ln x + x) + c$
C) $(\log_3 x) \cdot (x \cdot \ln x - x) + c$
D) $\log_3(x \cdot \ln x - x) + c$
E) $(\log_3 e) \cdot (x \cdot \ln x - x) + c$

16. $\int (e^x \cdot \sin x)dx = ?$

A) $\frac{e^x}{2}(\sin x - \cos x) + c$
B) $\frac{e^x}{2}(\sin x + \cos x) + c$
C) $\frac{e^x}{2}(\cos x - \sin x) + c$
D) $\frac{e^x}{2}(-\sin x - \cos x) + c$
E) $e^x \cdot (\cos x - \sin x) + c$

1. $\int \frac{1}{(1-\cos x)\cdot(1+\cos x)}dx = ?$

A) $\tan x + c$ B) $-\tan x + c$ C) $\cot x + c$
D) $-\cot x + c$ E) $\cos x + c$

2. $\int \left(x\cdot(x-1)\cdot(x+1)\right)dx = ?$

A) $x^3 - x + c$ B) $\frac{x^4}{4} - \frac{x^2}{2} + c$
C) $\frac{x^3}{3} - x + c$ D) $\frac{3x^2}{2} + c$
E) $\frac{x^4}{4} + \frac{x^2}{2} + c$

3. $\int \left((x^3+5)^2\cdot x^2\right)dx = ?$

A) $\frac{(x^3+5)^3}{3} + c$ B) $\frac{(x^3+5)^3}{9} + c$
C) $\frac{x^7}{7} + 25x + c$ D) $\frac{x^9}{9} + \frac{5x^2}{2} + c$
E) $\frac{(x^3+5)^3}{6} + c$

4. $\int \left(\frac{3}{x} + \cot^2 x\right)dx = ?$

A) $3\cdot\ln|x| - \cot x + c$
B) $3\cdot\ln|x| + \cot x + c$
C) $\ln|x| - \cot x + x + c$
D) $3\cdot\ln|x| - \cot x + x + c$
E) $3\cdot\ln|x| - \cot x - x + c$

5. $d\int (\sin x)dx = ?$

A) $\sin x$ B) $\sin x + c$ C) $(\sin x)\,dx$
D) $\cos x + c$ E) $(\cos x)\,dx$

6. $\int \frac{1}{2x\cdot\ln(2x)}dx = ?$

A) $\ln|\ln|2x||+c$ B) $\frac{\ln|\ln|2x||}{2}+c$
C) $2\ln|\ln|2x||+c$ D) $\ln|2x|+c$
E) $\frac{1}{\ln|2x|}+c$

7. $\int \frac{3}{\sqrt{4-9x^2}}dx = ?$

A) $\frac{2}{3}\arcsin\left(\frac{3x}{2}\right)+c$ B) $2\cdot\arcsin\left(\frac{3x}{2}\right)+c$
C) $3\cdot\arcsin\left(\frac{3x}{2}\right)+c$ D) $\arcsin\left(\frac{3x}{2}\right)+c$
E) $4\cdot\arcsin\left(\frac{3x}{2}\right)+c$

8. $\int \frac{1}{\sin^2(3x+1)}dx = ?$

A) $\cot(3x+1)+c$ B) $\tan(3x+1)+c$
C) $-\cot(3x+1)+c$ D) $-\frac{\cot(3x+1)}{3}+c$
E) $\frac{\tan(3x+1)}{3}+c$

9. $A = \int \frac{\sqrt{2+\sqrt{x}}}{\sqrt{x}}dx$

$u = 2+\sqrt{x}$

$\Rightarrow A = ?$

A) $\int \frac{\sqrt{u}}{2}du$ B) $\int \frac{2\sqrt{u}}{u}du$

C) $\int \frac{\sqrt{u}}{2u}du$ D) $\int 2\sqrt{u}du$

E) $\int \frac{\sqrt{u}}{u}du$

10. $\int (\tan^3 x + \tan x)dx = ?$

A) $\frac{\tan^2 x}{2}+c$ B) $\frac{\tan^4 x}{4}+\frac{\tan^2 x}{2}+c$

C) $\frac{\cot^2 x}{2}+c$ D) $\frac{\sin^3 x}{3}+\cos x+c$

E) $\frac{\cos^3 x}{3}+\sin x+c$

11. $\int \left(f(3x-1)\cdot f'(3x-1)\right)dx = ?$

A) $\frac{f^2(3x-1)}{2}+c$ B) $\frac{f^2(3x-1)}{6}+c$

C) $\frac{3f^2(3x-1)}{2}+c$ D) $\frac{2f^2(3x-1)}{3}+c$

E) $f^2(3x-1)+c$

12. $\int \frac{3x^3+2x}{x^2}dx = ?$

A) $3x+\frac{2}{x}+c$ B) $3x^2+2x+c$

C) $\frac{3x^2}{2}+\ln|x|+c$ D) $x^2+2\cdot\ln|x|+c$

E) $\frac{3x^2}{2}+2\cdot\ln|x|+c$

13. $\int \frac{3x+5}{2x+1}dx = ?$

A) $x+\frac{7}{2}\ln|2x+1|+c$

B) $\frac{3}{2}+\frac{7}{2}\ln|2x+1|+c$

C) $\frac{3x}{2}+\frac{7}{4}\ln|2x+1|+c$

D) $\frac{3x}{2}+\frac{7}{2}\ln|x|+c$

E) $\frac{3x}{2}+\frac{7}{2}\ln|2x+1|+c$

14. $\int \frac{x+1}{x^2+5x+6}dx = ?$

A) $\ln\frac{(x+3)^2}{|x+2|}+c$ B) $\ln\left|\frac{x+3}{x+2}\right|+c$

C) $\ln\frac{|x+3|}{(x+2)^2}+c$ D) $\ln\frac{\sqrt{x+3}}{|x+2|}+c$

E) $\ln\frac{|x+3|}{\sqrt{x+2}}+c$

15. $\int (x-2)\cdot e^x dx = ?$

A) $x\cdot e^x - e^x + c$ B) $x\cdot e^x - 2e^x + c$

C) $x\cdot e^x + e^x + c$ D) $x\cdot e^x - 3e^x + c$

E) $x\cdot e^x + 3e^x + c$

16. $\int (x\cdot\cos x)dx = ?$

A) $x\cdot\sin x + \cos x + c$ B) $-x\cdot\sin x + \cos x + c$

C) $x\cdot\sin x - \cos x + c$ D) $x\cdot\sin x + \sin x + c$

E) $-x\cdot\sin x - \cos x + c$

1. $\int_{1}^{2} x^2 dx = ?$

A) $\frac{5}{3}$ B) 2 C) $\frac{7}{3}$ D) $\frac{8}{3}$ E) 3

2. $\int_{0}^{4} (2x-3)dx = ?$

A) 7 B) 6 C) 5 D) 4 E) 3

3. $\int_{1}^{e^3} \left(\frac{1}{x}\right)dx = ?$

A) 4 B) 3 C) 2 D) 1 E) 0

4. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} (\cos x)dx = ?$

A) $\frac{1}{\sqrt{3}}$ B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{3}+1}{2}$ E) $\frac{\sqrt{3}-1}{2}$

5. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} (1+\tan^2 x)dx = ?$

A) 2 B) 1 C) 0 D) –1 E) –2

6. $\int_{4}^{9} \sqrt{x}\,dx = ?$

A) 12 B) $\frac{37}{3}$ C) $\frac{38}{3}$ D) 13 E) $\frac{40}{3}$

7. $\int_{0}^{1} 3^x dx = ?$

A) $3 \cdot \ln 3$ B) $2 \cdot \ln 3$ C) $3 \cdot \log_3 e$ D) $2 \cdot \log_3 e$ E) $\log_3 e$

8. $\int_{\frac{1}{3}}^{\frac{1}{2}} \frac{1}{x^2} dx = ?$

A) 2 B) 1 C) –1 D) –2 E) –3

9. $\int_1^e \ln x\,dx = ?$

A) e B) 1 C) 0 D) – 1 E) – e

10. $\int_1^{\sqrt{3}} \frac{2}{1+x^2}dx = ?$

A) $\frac{\pi}{2}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{6}$ E) $\frac{\pi}{12}$

11. $\int_b^a dx = 5$

$a + b = 13$

$\Rightarrow a \cdot b = ?$

A) 12 B) 18 C) 24 D) 30 E) 36

12. $\left.\begin{array}{l}\int_1^5 f(x)dx = 17 \\ \int_1^7 f(x)dx = 30\end{array}\right\} \Rightarrow \int_5^7 f(x)dx = ?$

A) – 47 B) –13 C) 13 D) 22 E) 47

13. $\frac{d}{dx}\left(\int_1^5 \sqrt{3x-5}\,dx\right) = ?$

A) –2 B) 0 C) 7 D) 10 E) 25

14. $f(x) = \frac{3x+2}{x-4}$

$\Rightarrow \int_4^5 d(f^{-1}(x)) = ?$

A) 30 B) 18 C) – 6 D) – 7 E) – 9

15. $A = \int_{\frac{1}{2}}^{\frac{\sqrt{3}}{2}} \frac{1}{\sqrt{1-x^2}}dx$

$x = \sin u$

$\Rightarrow A = ?$

A) $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} du$ B) $\int_{\frac{\pi}{3}}^{\frac{\pi}{6}} du$ C) $\int_{\frac{1}{2}}^{\frac{\pi}{2}} u\,du$

D) $\int_{\frac{1}{2}}^{\frac{\sqrt{3}}{2}} du$ E) $\int_{\frac{\pi}{3}}^{\frac{\pi}{6}} \frac{1}{\cos u}du$

16. $A = \int_1^9 \frac{\sqrt{x}+1}{2\sqrt{x}}dx$

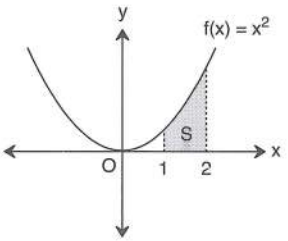
$u = \sqrt{x}+1$

$\Rightarrow A = ?$

A) $\int_2^4 u\,du$ B) $\int_1^9 u\,du$ C) $\int_1^9 \frac{u}{2}du$

D) $\int_2^4 \frac{u}{2}du$ E) $\int_1^3 \frac{u^2}{2}du$

1.

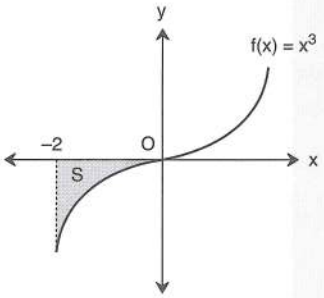


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{5}{3}$ B) 2 C) $\frac{7}{3}$ D) $\frac{8}{3}$ E) 3

2.

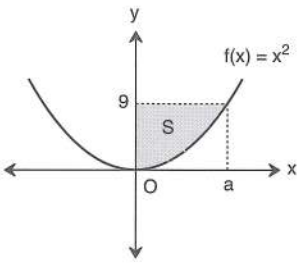


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{4}{3}$ D) $\frac{7}{3}$ E) 4

3.

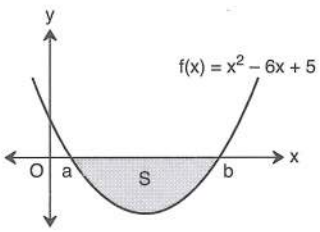


⇒ Taralı Alan = ?

Shaded Area = ?

A) 9 B) 12 C) 15 D) 18 E) 21

4.

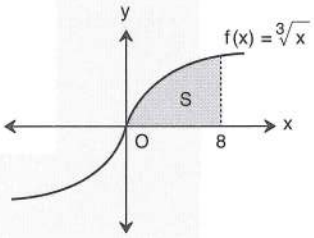


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{32}{3}$ B) 11 C) $\frac{37}{3}$ D) $\frac{40}{3}$ E) 16

5.

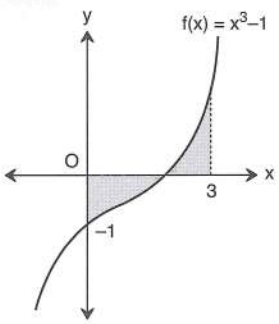


⇒ Taralı Alan = ?

Shaded Area = ?

A) 9 B) 12 C) 15 D) 17 E) 20

6.

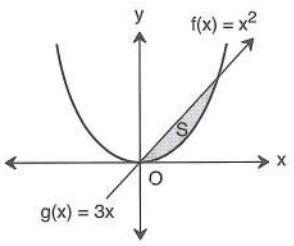


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{75}{4}$ B) $\frac{38}{2}$ C) $\frac{77}{4}$ D) $\frac{39}{2}$ E) 20

7.

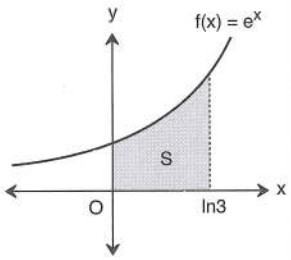


⇒ Taralı Alan = ?

Shaded Area = ?

A) 18 B) $\frac{27}{2}$ C) 9 D) $\frac{9}{2}$ E) 3

8.

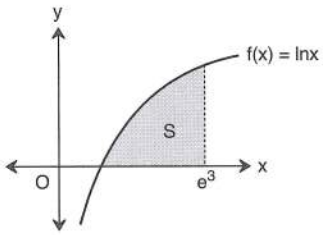


⇒ Taralı Alan = ?

Shaded Area = ?

A) 3 B) $\frac{5}{2}$ C) 2 D) $\frac{3}{2}$ E) 1

9.

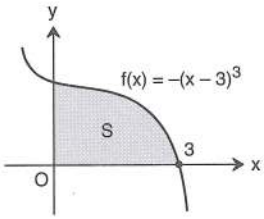


⇒ Taralı Alan = ?

Shaded Area = ?

A) $e^2 - 2$ B) $e^2 - 1$ C) $2e^3$ D) $2e^{-3} + 1$ E) $2e^3 + 1$

10.

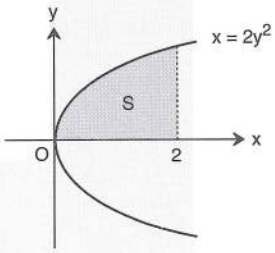


⇒ Taralı Alan = ?

Shaded Area = ?

A) 9 B) $\frac{81}{4}$ C) 54 D) $\frac{162}{5}$ E) $\frac{243}{4}$

11.

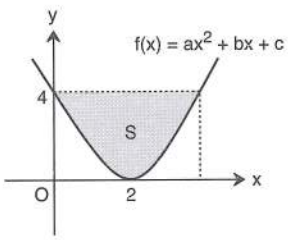


⇒ Taralı Alan = ?

Shaded Area = ?

A) 1 B) $\frac{4}{3}$ C) $\frac{3}{4}$ D) $\frac{2}{3}$ E) $\frac{1}{3}$

12.

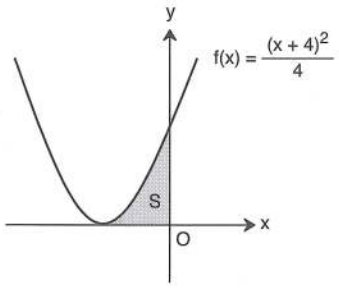


⇒ Taralı Alan = ?

Shaded Area = ?

A) 4 B) $\frac{16}{3}$ C) 8 D) $\frac{32}{3}$ E) 16

1.

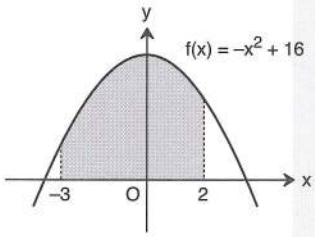


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{5}{3}$ B) $\frac{8}{3}$ C) $\frac{16}{3}$ D) $\frac{20}{3}$ E) 8

2.

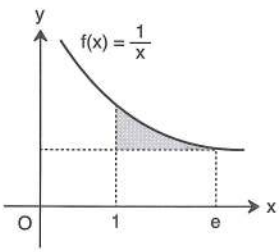


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{13}{3}$ B) 5 C) 7 D) $\frac{205}{3}$ E) $\frac{214}{3}$

3.

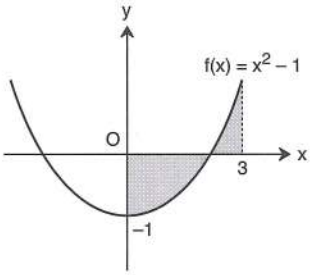


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{e+1}{2e}$ B) $\frac{e-1}{2}$ C) $2 + e$ D) $\frac{e+1}{2}$ E) $\frac{1}{e}$

4.

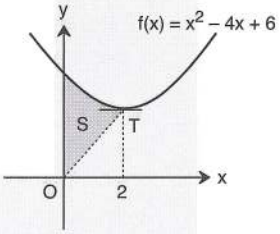


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{11}{5}$ B) $\frac{22}{3}$ C) $\frac{15}{2}$ D) 7 E) 15

5.

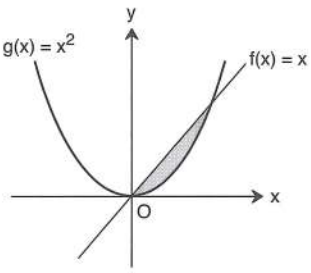


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{25}{3}$ B) $\frac{5}{3}$ C) $\frac{14}{3}$ D) $\frac{10}{3}$ E) $\frac{20}{3}$

6.

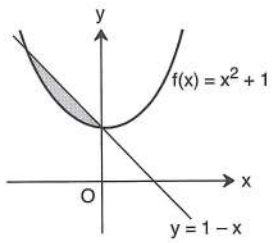


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{5}$ E) $\frac{1}{6}$

7.

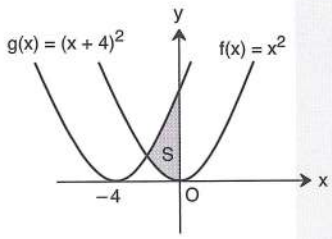


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{1}{3}$ B) $\frac{1}{6}$ C) $\frac{1}{9}$ D) $\frac{2}{9}$ E) $\frac{2}{3}$

8.

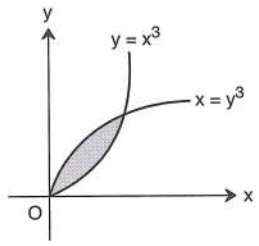


⇒ Taralı Alan = ?

Shaded Area = ?

A) 18 B) 17 C) 16 D) 15 E) 14

9.

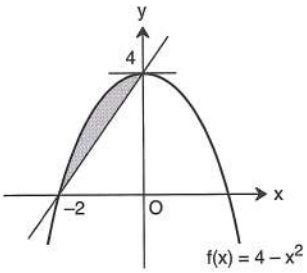


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{1}{6}$ B) $\frac{1}{4}$ C) $\frac{1}{2}$ D) 1 E) 2

10.

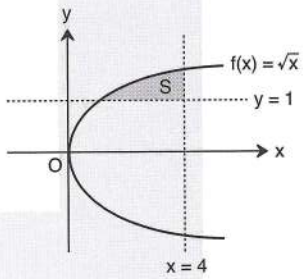


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{5}{8}$ B) $\frac{4}{3}$ C) $\frac{8}{3}$ D) $\frac{16}{3}$ E) $\frac{20}{3}$

11.

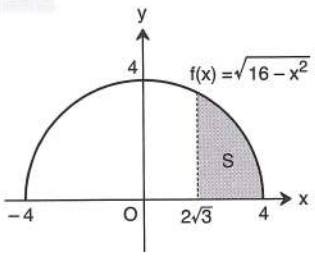


⇒ Taralı Alan = ?

Shaded Area = ?

A) 3 B) $\frac{7}{3}$ C) 2 D) $\frac{5}{3}$ E) $\frac{2}{3}$

12.



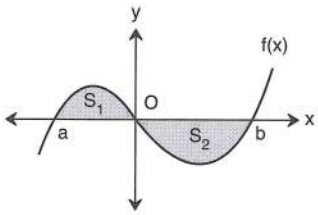
⇒ Taralı Alan = ?

Shaded Area = ?

A) $\pi + 2\sqrt{3}$ B) $\frac{\pi}{2} - \sqrt{3}$ C) $\frac{4\pi}{3} + \sqrt{3}$

D) $\frac{4\pi}{3} - 2\sqrt{2}$ E) $\frac{4\pi}{3} - 2\sqrt{3}$

1.



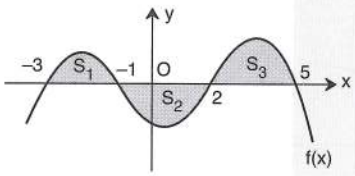
$S_1 = 3\ br^2$

$S_2 = 7\ br^2$

$\Rightarrow \int_a^b f(x)dx = ?$

A) 10 B) 4 C) 3 D) – 4 E) –10

2.



$S_1 = 2\ br^2$

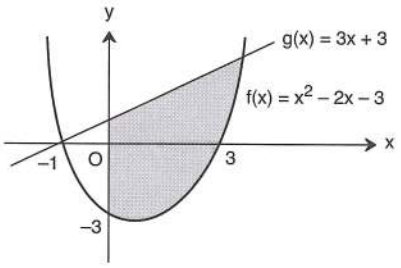
$S_2 = 3\ br^2$

$S_3 = 7\ br^2$

$\Rightarrow \int_{-3}^{5} f(x)dx = ?$

A) –7 B) –2 C) 6 D) 8 E) 12

3.

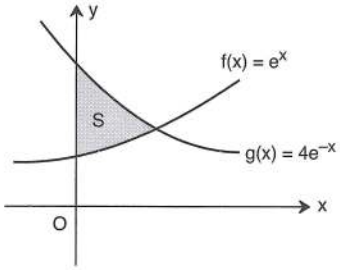


⇒ Taralı Alan = ?

Shaded Area = ?

A) 42 B) 44 C) 46 D) 48 E) 54

4.

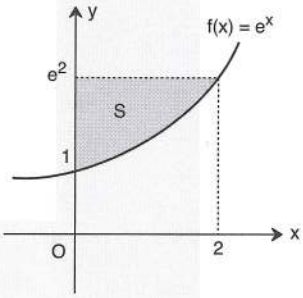


⇒ Taralı Alan = ?

Shaded Area = ?

A) 2 ln3 B) ln3 C) 4 D) 2 E) 1

5.

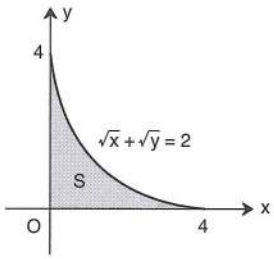


⇒ Taralı Alan = ?

Shaded Area = ?

A) $e^2 + 1$ B) $e^2 - 3$ C) $e^2 - 1$ D) $2e^2 - 1$ E) $2e^2 + 1$

6.

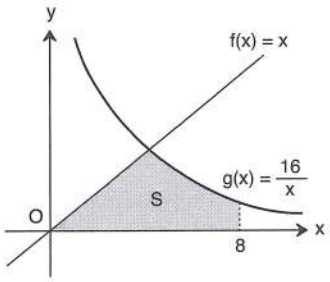


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{4}{3}$ D) $\frac{8}{3}$ E) $\frac{16}{3}$

7.

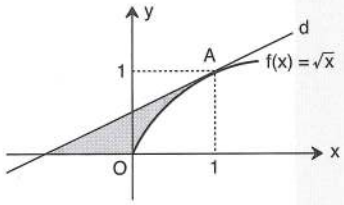


⇒ Taralı Alan = ?

Shaded Area = ?

A) 8(1 + ln2)
B) 8(2 + ln2)
C) 8(1 + 2 ln2)
D) 4 + ln2
E) 4 + 2 ln2

8.

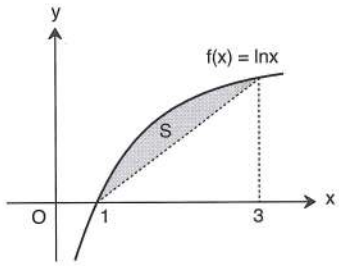


⇒ Taralı Alan = ?

Shaded Area = ?

A) $\frac{1}{2}$ B) $\frac{2}{5}$ C) 1 D) $\frac{2}{3}$ E) $\frac{1}{3}$

9.

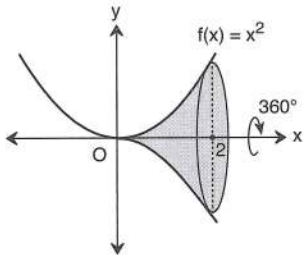


⇒ Taralı Alan = ?

Shaded Area = ?

A) 2 ln3 – 2 B) ln3 –1 C) ln3 + 1
D) 3 ln3 + 2 E) 3 ln3 + 2

10.

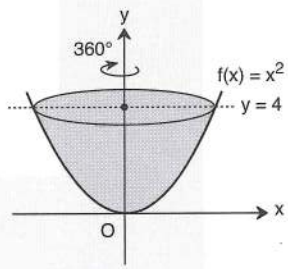


Şekildeki dönel cismin hacmi kaç br^3 tür?

What is the volume of the solid of revolution in the figure in terms of br^3?

A) $\frac{28\pi}{5}$ B) 6π C) $\frac{32}{5}\pi$ D) $\frac{34\pi}{5}$ E) 7π

11.

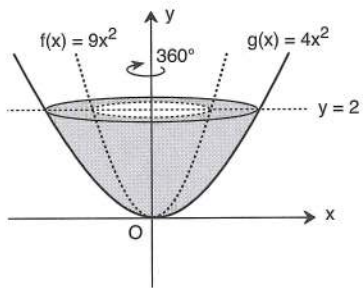


Şekildeki dönel cismin hacmi kaç br^3 tür?

What is the volume of the solid of revolution in the figure in terms of br^3?

A) 4π B) 5π C) 6π D) 7π E) 8π

12.



Şekildeki dönel cismin hacmi kaç br^3 tür?

What is the volume of the solid of revolution in the figure in terms of br^3?

A) $\frac{\pi}{2}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{6}$ D) $\frac{2\pi}{9}$ E) $\frac{5\pi}{18}$

1. $f(x)=\begin{cases}5 & x\geq 2\\ 1 & 0<x<2\\ -2 & x\leq 0\end{cases}$

$\Rightarrow \int_{-1}^{10} f(x)\,dx = ?$

A) 36 B) 38 C) 40 D) 42 E) 44

2. $f(x)=\begin{cases}2x & x\geq 1\\ x^2-1 & x<1\end{cases}$

$\Rightarrow \int_{0}^{2} f(x)\,dx = ?$

A) 2 B) $\frac{7}{3}$ C) $\frac{8}{3}$ D) 3 E) $\frac{10}{3}$

3. $f(x)=\begin{cases}e^x & x>0\\ x^2 & x\leq 0\end{cases}$

$\Rightarrow \int_{-1}^{2} f(x)\,dx = ?$

A) $e^2+\frac{1}{3}$ B) e^2-1 C) $e^2-\frac{2}{3}$ D) $e+\frac{1}{3}$ E) $e-1$

4. $f(x)=\begin{cases}x & x>1\\ 3 & 0<x<1\\ -x & x<0\end{cases}$

$\Rightarrow \int_{-3}^{7} f(x)\,dx = ?$

A) $\frac{63}{2}$ B) 30 C) $\frac{59}{2}$ D) 27 E) $\frac{33}{2}$

5. $\int_{-2}^{3} |x|\,dx = ?$

A) $\frac{13}{2}$ B) 6 C) $\frac{11}{2}$ D) 5 E) $\frac{5}{2}$

6. $\int_{1}^{5} |x-3|\,dx = ?$

A) -1 B) 1 C) 2 D) 3 E) 4

7. $\int_{-3}^{5} \frac{|x|}{x}\,dx = ?$

A) -5 B) -3 C) 2 D) 6 E) 8

8. $\int_{-2}^{3} (x\cdot|x|)\,dx = ?$

A) $\frac{16}{3}$ B) $\frac{17}{3}$ C) 6 D) $\frac{19}{3}$ E) $\frac{20}{3}$

9. $\int_{-5}^{8} \operatorname{sgn}(x)\,dx = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

10. $\int_{-7}^{10} \operatorname{sgn}(x^2-4)\,dx = ?$

A) 12 B) 11 C) 10 D) 9 E) 8

11. $\int_{0}^{5} \operatorname{sgn}(x^2-4x+3)\,dx = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

12. $\int_{\frac{\pi}{2}}^{2\pi} \sin x \cdot \operatorname{sgn}(\cos x)\,dx = ?$

A) 2 B) 1 C) 0 D) –1 E) –2

13. $\int_{0}^{5} [x]\,dx = ?$

A) 15 B) 10 C) 5 D) 4 E) 2

14. $\int_{0}^{10} \left[\frac{x}{2}+1\right] dx = ?$

A) 20 B) 25 C) 30 D) 35 E) 40

15. $\int_{4}^{25} [\sqrt{x}]\,dx = ?$

A) 67 B) 68 C) 69 D) 70 E) 71

16. $\int_{3}^{30} [\log_3 x]\,dx = ?$

A) 45 B) 48 C) 49 D) 50 E) 51

1. $\int_{-1}^{3} x\,dx = ?$

A) 4 B) 3 C) $\frac{5}{2}$ D) $\frac{1}{2}$ E) -1

2. $\int_{1}^{4} e^{2x}\,dx = ?$

A) $e^4 - 1$ B) $\frac{e^2}{2}(e^4 - 1)$ C) $e^8 - e$ D) e^4 E) $\frac{e^2}{2}(e^6 - 1)$

3. $\int_{0}^{\frac{\pi}{4}} \frac{1}{\cos^2 x}\,dx = ?$

A) $\frac{1}{\sqrt{3}} - 1$ B) $\sqrt{3}$ C) 1 D) $\sqrt{3} - 1$ E) 2

4. $\int_{0}^{\frac{\pi}{3}} \tan x\,dx = ?$

A) ln2 B) 2 ln2 C) – ln2 D) 1 E) 0

5. $\int_{0}^{1} \frac{x+2}{x+1}\,dx = ?$

A) ln(2e) B) 1 + e C) 1 D) –1 + e E) $\ln\left(\frac{2}{e}\right)$

6. $\int_{1}^{e} \frac{\ln x}{x}\,dx = ?$

A) 2 B) 1 C) $\frac{1}{2}$ D) 0 E) $-\frac{1}{2}$

7. $\int_{-2}^{-1} \frac{1}{x^2 + 4x + 5}\,dx = ?$

A) π B) $\frac{\pi}{2}$ C) $\frac{\pi}{3}$ D) $\frac{\pi}{4}$ E) $\frac{\pi}{6}$

8. $\int_{-1}^{2} \text{sgn}x\,dx = ?$

A) 4 B) 3 C) 2 D) 1 E) 0

9. $\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \sin^3 x\,dx = ?$

A) $\frac{3\sqrt{3}}{8}$ B) $\frac{\sqrt{3}}{2}$ C) 0 D) $-\frac{1}{8}$ E) $-\frac{1}{2}$

10. $\int_{-3}^{3} (x^2+3)\,dx = ?$

A) 40 B) 36 C) 32 D) 24 E) 18

11. $\dfrac{\int_{-5}^{5} \left(\cos^2 x + x^4 + |x|\right)dx}{\int_{0}^{5} \left(\cos^2 x + x^4 + |-x|\right)dx} = ?$

A) 2 B) 1 C) $\frac{1}{2}$ D) –1 E) –2

12. $f(x) = \int_{1}^{2x} (x^2+x+1)\,dx$

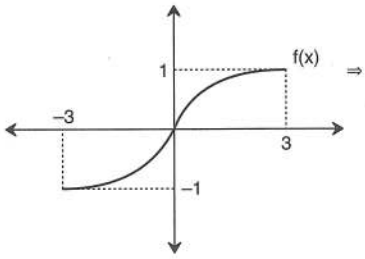
$\Rightarrow f'(1) = ?$

A) 14 B) 12 C) 10 D) 8 E) 6

13. $\int_{-3}^{3} \sqrt{9-x^2}\,dx = ?$

A) 9π B) 6π C) $\frac{11\pi}{2}$ D) $\frac{9\pi}{2}$ E) 3π

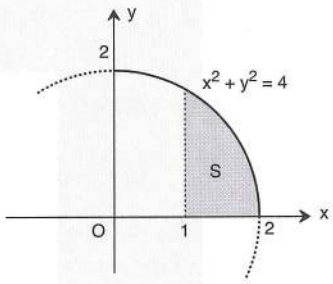
14.



$\Rightarrow \int_{-3}^{3} \left(\left[\!\left[f(x)\right]\!\right]\right)dx = ?$

A) 6 B) 3 C) 0 D) –2 E) –3

15.



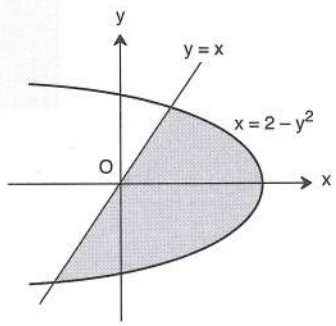
$\Rightarrow$ Taralı Alan = ?

Shaded Area = ?

A) $\int_{1}^{2} \sqrt{4-y^2}\,dy$ B) $\int_{0}^{1} \sqrt{2-x^2}\,dx$ C) $\int_{0}^{2} \sqrt{4-y}\,dy$

D) $\int_{1}^{2} \sqrt{4-x^2}\,dx$ E) $\int_{1}^{2} \sqrt{2-x^2}\,dx$

16.



$\Rightarrow$ Taralı Alan = ?

Shaded Area = ?

A) $\frac{1}{\sqrt{2}}$ B) $\frac{3+\sqrt{2}}{2}$ C) $\frac{1-\sqrt{2}}{2}$

D) $\frac{9}{2}$ E) $\frac{1+4\sqrt{2}}{2}$

1. $\int x\,dy = ?$

A) $\frac{x^2}{2}+c$ B) $1+c$ C) $x+c$ D) $xy+c$ E) $\frac{x^2y}{2}+c$

2. $\int (x-3)^2dx = ?$

A) $x-3+c$ B) $x-3+c$ C) $\frac{(x-3)^3}{3}+c$ D) x^2-2x+c E) $x+c$

3. $\int \frac{2x+\sqrt{x}}{\sqrt{x}}dx = ?$

A) $2x^{\frac{3}{2}}+c$ B) $2x^{\frac{2}{3}}+x+c$ C) $\frac{4}{3}x^{\frac{3}{2}}+x+c$ D) $3x^{\frac{3}{2}}+x+c$ E) $x+c$

4. $\int \cos^2(3x)\,dx + \int \sin^2(3x)\,dx = ?$

A) $x+c$ B) $3x+c$ C) $\cos(6x)+c$ D) $\frac{1}{2}\cos(4x)+c$ E) $-\frac{1}{2}\cos(4x)+c$

5. $\int (\sin x+\cos x)^2dx = ?$

A) $x-\frac{1}{2}\cos(2x)+c$ B) $\frac{-\cos(2x)}{2}+c$ C) $x-2\cos x+c$ D) $-\frac{1}{2}\sin(2x)+c$ E) $\sin(2x)-\cos(2x)+c$

6. $\int (x^2+1)\,d(x^2-1) = ?$

A) $\frac{(x^2-1)^2}{2}+c$ B) $\frac{(x^2-1)^2}{2}+2(x^2-1)+c$ C) $\frac{(x^2+1)^2}{2}+c$ D) $\frac{(x^2+1)^2}{2}+2(x^2+1)+c$ E) $\frac{(x^2+1)^2}{2}-2(x^2+1)+c$

7. $\int \frac{x\,dx}{\sqrt{x^2-1}} = ?$

A) $\sqrt{x^2-1}+c$ B) $\sqrt{x^2+2}+c$ C) $-\sqrt{x^2-1}+c$ D) $\sqrt{x^2+1}+c$ E) $-\sqrt{x^2+1}+c$

8. $\int (1+\tan^2x)\,d(\tan x) = ?$

A) $\tan x+c$ B) $\tan x+\frac{\tan^3x}{3}+c$ C) $\frac{\tan^2x}{2}+c$ D) $\frac{\arctan^2x}{2}+c$ E) $\ln|\tan x|+c$

9. $\int \frac{3\,dx}{e^x+3} = ?$

A) $\ln|e^x - 3| + c$ B) $\ln|x^e + 3| + c$
C) $x - \ln|e^x + 3| + c$ D) $x + \ln|e^x + 3| + c$
E) $x - e^x + c$

10. $\int \frac{dx}{x^2+4x+5} = ?$

A) $\arctan x + c$ B) $\arctan(x - 1) + c$
C) $\arctan(x + 2) + c$ D) $\arctan(x - 2) + c$
E) $2 \cdot \arctan(x + 2) + c$

11. $\int \frac{9x}{1+9x^4}dx = ?$

A) $\arctan(\ln|3x|) + c$ B) $\arctan(2x^2) + c$
C) $\frac{3}{2}\arctan(3x^2) + c$ D) $\arctan(3x) + c$
E) $\arctan(\ln(2x)) + c$

12. $\int \frac{x+2}{x-1}dx = ?$

A) $x + 3 \cdot \ln|x - 1| + c$ B) $x + \ln|x - 1| + c$
C) $\ln\left|\frac{x+2}{x-1}\right| + c$ D) $\ln\left|\frac{x}{x-1}\right| + c$
E) $2 \cdot \ln|x - 2| + x + c$

13. $\int \frac{x-1}{x^2-2x+6}dx = ?$

A) $\ln(x^2 - 2x + 6) + c$ B) $x^2 - 2x + c$
C) $2 \cdot \ln(x^2 - 2x + 6) + c$ D) $\ln\left|\frac{x-1}{x^2-2x+6}\right| + c$
E) $\frac{\ln(x^2-2x+6)}{2} + c$

14. $\int \frac{\sqrt[3]{x-1}+2}{\sqrt{x-1}}dx$ integralinde $x = t^6 + 1$ dönüşümü yapılırsa aşağıdakilerden hangisi elde edilir?

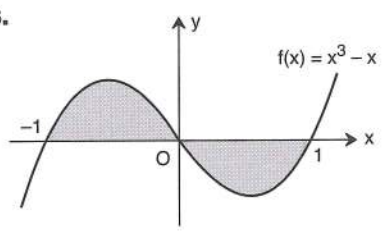
What is the answer if $\int \frac{\sqrt[3]{x-1}+2}{\sqrt{x-1}}dx$ *integral is converted to* $x = t^6 + 1$*?*

A) $6\int (t^4 + t)dt$ B) $6\int (t^4 + t^2)dt$
C) $3\int \frac{t^2+2}{t^3}dt$ D) $6\int (t^4 + 2t^2)dt$
E) $3\int (t^2 + 1)dt$

15. $\begin{matrix} f(x) = x - 5 \\ g(x) = 3x^2 + 1 \end{matrix} \Rightarrow \int_{-2}^{0} (fog)(x)\,dx = ?$

A) -16 B) -8 C) 0 D) 8 E) 16

16. ⇒ Taralı alan = ?
Shaded area = ?



A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2 E) $\frac{5}{2}$

1. $\int (12x^2 - 4x)\,dx = ?$

A) $6x^3 - 4 + c$
B) $24x - 4 + c$
C) $4x^3 - 2x^2 + c$
D) $4x^3 - 4x^2 + c$
E) $12x^2 - 4x + c$

2. $\int x\,f(x)\,dx = x^3 - 2x^2 + 1$
$\Rightarrow f(x) = ?$

A) $3x^2 - 4$
B) $3x - 4$
C) $3x^2 - 4x$
D) $3x^2 + 4x$
E) $x^2 - 2x$

3. $\int \frac{x^6 - 9}{x^3 + 3}\,dx = ?$

A) $x^3 - 3x + c$
B) $x^4 - 3x + c$
C) $\frac{x^4}{4} + 3x + c$
D) $\frac{x^4}{4} - 3x + c$
E) $\frac{x^3}{3} - 3x + c$

4. $\int \frac{2x}{x^2 - 6}\,dx = ?$

A) $2\ln|x^2 - 6| + c$
B) $\ln|x - 6| + c$
C) $\ln|x^2 - 6| + c$
D) $\ln|x| + 6 + c$
E) $\ln|x^2 + 6| + c$

5. $\int (2 + \tan^2 x)\,dx = ?$

A) $x + \tan x + c$
B) $2x + \tan x + c$
C) $x + \cot x + c$
D) $x - \tan x + c$
E) $x - \cot x + c$

6. $\int \frac{x - 2}{x^2 - 4x}\,dx = ?$

A) $\ln|x^2 - 4x| + c$
B) $2 \cdot \ln|x^2 - 4x| + c$
C) $\frac{\ln|x^2 - 4x|}{2} + c$
D) $-2 \cdot \ln|x^2 - 4x| + c$
E) $-\ln|x^2 - 4x| + c$

7. $\int (\cot x - \tan x)\,dx = ?$

A) $\ln|\sin(2x)| + c$
B) $-\ln|\tan x| + c$
C) $\frac{1}{2}\ln|\sin(2x)| + c$
D) $\ln|\cot x| + c$
E) $\tan x + c$

8. $\int \frac{\arcsin x}{\sqrt{1 - x^2}}\,dx = ?$

A) $\sin x \cdot \left(\sqrt{1 - x^2}\right) + c$
B) $\frac{1}{2}(\arcsin x)^2 + c$
C) $2(\arccos x)^2 + c$
D) $2(\arcsin x)^2 + c$
E) $-(\arcsin x)^2 + c$

9. $\int \frac{x^3+3x^2+x+1}{x^3+x}dx = ?$

A) $\ln|x^3+x| + x^2 - 3 + c$
B) $x - \ln|x^2+x| + c$
C) $x + \ln|x^3+x| + c$
D) $x^3 - 2x + c$
E) $x^2 - x + c$

10. $\int (4x\,e^{2x})dx = ?$

A) $\frac{e^{2x}\cdot(x-1)}{2} + c$
B) $\frac{e^{2x}\cdot(x+1)}{2} + c$
C) $\frac{e^{2x}\cdot(2x-1)}{2} + c$
D) $e^{2x}\cdot(2x-1) + c$
E) $\frac{e^{2x}\cdot(2x+1)}{2} + c$

11. $\int d(\sin x) = ?$

A) $\sin x + c$
B) $\cos x + c$
C) $-\sin x + c$
D) $-\cos x + c$
E) $\frac{\cos^2 x}{2} + c$

12. $\int \sqrt[3]{2x+4}\,dx = ?$

A) $\frac{3}{8}(2x+4) + c$
B) $\frac{3}{8}(2x+4)\sqrt[3]{2x+4} + c$
C) $\frac{1}{4}(2x+4) + c$
D) $2x + 4 + c$
E) $\frac{3}{4}\sqrt[4]{(2x+4)^3} + c$

13. $\int x^2 \sin x\,dx = ?$

A) $-x^2\cdot\sin x + \cos x + c$
B) $x^2\cdot\cos x - \sin x + c$
C) $x^2\cdot\cos x + \sin x + c$
D) $-x^2\cdot\cos x + 2x\cdot\sin x + 2\cdot\cos x + c$
E) $-x^2\cdot\cos x - \sin x + c$

14. $\int \left(x\cdot 5^{\log_5 e^x}\right)dx = ?$

A) $x\cdot e^x - e^x + c$
B) $x\cdot e^x - x + c$
C) $x\cdot e^x + e^x + c$
D) $x\cdot e^x + x + c$
E) $e^x - x\cdot e^x + c$

15. $\int_1^5 f(x)dx = 8$

$\Rightarrow \int_1^3 f(2x-1)dx = ?$

A) 2 B) 4 C) 8 D) 12 E) 15

16. $\int_1^3 \frac{x^4-x^3}{x^2}dx = ?$

A) $\frac{26}{3}$ B) $\frac{14}{3}$ C) 4 D) $\frac{8}{3}$ E) 2

1. $\int \frac{dx}{x \cdot \ln x} = ?$

A) $\ln|x| + c$
B) $\ln|\ln x| + c$
C) $\ln|x + \ln|x|| + c$
D) $\frac{x}{\ln|x|} + c$
E) $x - \ln|x| + c$

2. $\int (x \cdot \sin x)\,dx = ?$

A) $x \cdot \cos x - \sin x + c$
B) $x \cdot \cos x + c$
C) $\sin x - x \cdot \cos x + c$
D) $\cos x - \sin x + c$
E) $\sin^2 x + c$

3. $\int (\cos^3 x \cdot \sin x)\,dx = ?$

A) $-\frac{1}{4}\cos^4 x + c$
B) $\frac{1}{3}\cos^3 x + c$
C) $-\frac{1}{3}\cos^3 x + c$
D) $-\frac{1}{5}\cos^5 x + c$
E) $\frac{1}{5}\cos^5 x + c$

4. $\int_0^2 (x^2 \cdot e^x)\,dx = ?$

A) $2e^2 - 2$
B) $2e^2$
C) $4e^2$
D) $8e^2 - 1$
E) $16e^2$

5. $\frac{d}{dx}\left(\int_{-2}^{6} (x^2 - 7x)\,dx\right) = ?$

A) -11
B) -7
C) 0
D) 7
E) 11

6. $\int x^2 \cos x\,dx = ?$

A) $x^2 \cdot \sin x + x \cdot \cos x - \sin x + c$
B) $x^2 \cdot \sin x + x \cdot \cos x + \sin x + c$
C) $x^2 \cdot \sin x + 2x \cdot \cos x - 2 \cdot \sin x + c$
D) $x^2 \cdot \sin x + 2x \cdot \cos x + 2 \cdot \sin x + c$
E) $x^2 \cdot \sin x + 4x \cdot \cos x - 2 \cdot \sin x + c$

7. $\int (2x + f(x))\,dx = x^3 + 2x^2 - 4x + 10$

$\Rightarrow f(x) = ?$

A) $3x^2 + 4x$
B) $3x^2 + 2x - 4$
C) $x^3 + 2x^2 - 2x - 4$
D) $3x^2 + x$
E) $3x^2 - x$

8. $\int_{-2}^{2} \sqrt{4 - x^2}\,dx = ?$

A) π
B) 2π
C) 4π
D) 6π
E) 8π

9. $\int \frac{dx}{x^2(x-1)} = ?$

A) $\ln\left|\frac{x-1}{x}\right| + \frac{1}{x} + c$
B) $\ln\left|\frac{x-1}{x}\right| + c$
C) $\ln\left|\frac{x-1}{x}\right| - \frac{1}{x} + c$
D) $\frac{x-1}{\ln|x|} + c$
E) $\frac{x+1}{\ln|x|} + c$

10. $\int \frac{\sin(1+\sqrt{x})}{\sqrt{x}} dx = ?$

A) $-2 \cdot \cos(1+\sqrt{x}) + c$
B) $-\cos(1+\sqrt{x}) + c$
C) $-2 \cdot \cos\sqrt{x} + c$
D) $\cos(1+\sqrt{x}) + c$
E) $2 \cdot \cos(1+\sqrt{x}) + c$

11. $\int_0^2 \sqrt{8-x^2}\, dx = ?$

A) $\pi + 2$
B) $\pi - 2$
C) 2π
D) $2\pi - 4$
E) $2\pi + 4$

12. $\int e^{\ln(x^3-1)} dx = ?$

A) $x^3 - 1 + c$
B) $3x^2 + c$
C) $\frac{x^4}{4} - x + c$
D) $e^{3x^2-x} + c$
E) $\frac{x^2}{3} + \frac{x}{2} + c$

13. $\int_0^2 e^{2x} dx = ?$

A) $e^2 - 1$
B) $e^4 - 1$
C) $\frac{e^4-1}{2}$
D) $e^4 + 1$
E) $\frac{e^4+1}{4}$

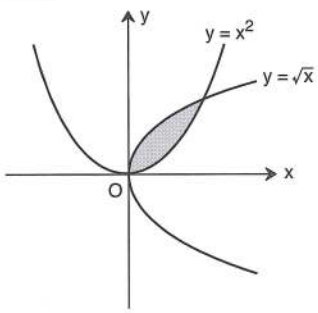
14. $\int_1^3 d\left(\frac{x+1}{x+2}\right) = ?$

A) $\frac{1}{3}$
B) $\frac{1}{5}$
C) $\frac{2}{15}$
D) 1
E) 2

15. $\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} (\sec^2 x \cdot \tan x)\, dx = ?$

A) -1
B) $-\frac{1}{2}$
C) $-\frac{4}{\sqrt{3}}$
D) 0
E) 1

16. ⇒ Taralı alan = ?
Shaded area = ?



A) 1
B) $\frac{1}{2}$
C) $\frac{1}{3}$
D) $\frac{1}{4}$
E) $\frac{1}{5}$

İNTEGRAL
INTEGRAL

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	D	A	E	D	C	D	C	D	B	C	D	B	C	C

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	D	A	A	B	E	E	A	C	D	E	D	B	E	E

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	C	D	B	C	E	A	B	A	C	E	D	C	A	A	C

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	B	B	A	C	B	A	B	A	C	A	D	D	C	E

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	E	A	C	A	A	B	C	D	B	B	E	A	C	D	B

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	B	E	C	B	D	C	B	C	B	B	C	C	C	E

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	D	B	D	D	A	E	E	E	C	A	A	A	D	C

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	C	A	B	E	C	C	A	E	B	D	A	A	D	C	E

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	E	C	D	E	D	D	B	D	E	B	B	D	B	E

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	C	E	E	E	A	E	E	B	D	E	A	A	D	E	A

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	B	E	C	B	D	D	D	A	B	E	C	A	D	A

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	B	E	A	C	D	B	B	D	E	C	B	D	A	A

TEST 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	E	D	A	B	A	D	C	E	B	B	D				

TEST 14

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	D	E	B	C	E	B	C	C	B	D	E				

TEST 15

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	C	E	E	A	D	C	E	A	C	E	E				

TEST 16

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	C	A	A	E	C	D	B	D	A	D	B	C	A	E

TEST 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	C	A	A	C	D	D	C	B	A	A	D	E	D	D

TEST 18

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	C	C	A	A	C	A	B	C	C	C	A	E	D	C	A

TEST 19

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	B	D	C	A	C	A	B	C	D	A	B	D	A	B	B

TEST 20

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	C	A	A	C	C	B	B	A	A	A	C	C	C	C	C

MATRİS

MATRIX

MATRİS

ÖZELLİK | Property 1

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ a_{m1} & a_{m2} & \cdots & \cdots & a_{mn} \end{bmatrix}_{mxn}$$

Matris yukarıdaki gibi bir tablodur. Yatay sıralara satır, dikey sıralara sütun denir. Yukarıdaki matriste m tane satır, n tane sütun bulunmaktadır. Bu matris m x n tipinden bir matristir.

Matrix is table as shown above. Harizontal lines are called "Row"; and vertical lines are called "Column". The matrix above is a 'm x n' matrix.

$$A = [a_{ij}]_{m \times n}$$

biçiminde gösterilir *(shown in this format)*

Matrisin her bir elemanı a_{ij} ile belirtilir.

a_{ij} : Matrisin i. satır, j. sütununda bulunan elemandır.

every element of a matrix is shown as a_{ij}.

a_{ij} is an element of a matrix which is in "i" row and "j" column.

1. $\begin{bmatrix} 3 & 4 & 2 \\ 4 & 2 & 1 \end{bmatrix}_{mxn}$ $\Rightarrow m \times n = ?$

2 x 3

2. $\begin{bmatrix} 4 & 2 & 1 \\ 3 & 1 & 4 \\ 2 & 1 & 3 \\ 4 & 2 & 1 \end{bmatrix}_{mxn}$ $\Rightarrow m \times n = ?$

4 x 3

3. $\begin{bmatrix} -1 & 1 & 3 \\ 0 & 2 & -2 \end{bmatrix}_{2x3}$ $\Rightarrow a_{13} = ?$

3

4. $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}_{mxn}$ $\Rightarrow m \times n = ?$

3 x 1

5. $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 2 \\ 1 & 4 & 1 \end{bmatrix}_{3x3}$ $\Rightarrow a_{23} = ?$

2

6. $\begin{bmatrix} 2 & 7 & 5 \\ 6 & -2 & 3 \\ -1 & 4 & 5 \end{bmatrix}_{3x3}$ $\Rightarrow \dfrac{a_{22} + a_{13}}{a_{31}} = ?$

−3

7. $\begin{bmatrix} 1 & 2 & 3 & 4 \\ -3 & 4 & -5 & 6 \end{bmatrix}_{2x4}$ $\Rightarrow a_{12} + a_{24} = ?$

8

8. $\begin{bmatrix} -2 & 3 & 4 \\ -1 & 4 & 6 \\ 1 & 2 & 1 \end{bmatrix}_{3x3}$ $\Rightarrow a_{12} \cdot a_{23} - a_{33} = ?$

17

ÖZELLİK | Property 2

- Satır sayısı, sütun sayısına eşit olan matrise kare matris denir.

If the number of rows and columns of a matrix are equal, its called square matrix.

$$A = [a_{ij}]_{nxn}$$

- Bir kare matriste satır sayısı ile sütun sayısı eşit olan elemanlar, matrisin köşegenini oluşturur.

In a square matrix, the elements whose numbers of rows and columns are equal will make the matrix diagonal.

$$A = \begin{bmatrix} a_{11} & \dots & \dots & \dots \\ \dots & a_{22} & \dots & \dots \\ \dots & \dots & \dots & \dots \\ \dots & \dots & \dots & a_{nn} \end{bmatrix}_{nxn}$$

- Köşegen üzerindeki elemanlar "1" ve diğer tüm elemanları "0" olan kare matrise birim matris denir.

The elements of a matrix which are "1" and are own the main diagonal when the other elements are "0" is called identity matrix.

$$I = \begin{bmatrix} 1 & 0 & 0 & \dots & 0 \\ 0 & 1 & 0 & \dots & 0 \\ 0 & 0 & 1 & \dots & 0 \\ \vdots & \vdots & \vdots & & \vdots \\ \dots & \dots & \dots & \dots & 1 \end{bmatrix}_{nxn}$$

$$I = [I_{ij}]_{nxn} \qquad I_{ij} = \begin{cases} 1 & i = j \\ 0 & i \neq j \end{cases}$$

1. $I = [I_{ij}]_{2x2} \Rightarrow I = ?$

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}_{2x2}$

2. $I = [I_{ij}]_{3x3} \Rightarrow I = ?$

$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}_{3x3}$

3. $I = \begin{bmatrix} x-2 & 0 \\ 0 & y+4 \end{bmatrix}_{2x2} \Rightarrow x \cdot y = ?$

-9

4. $I = \begin{bmatrix} a-1 & b & c+2 \\ d & e-2 & f+3 \\ k & m-1 & t \end{bmatrix}_{3x3} \Rightarrow \dfrac{a+e-t}{c} = ?$

-2

5. $I = \begin{bmatrix} 4^{x-y} & 0 \\ x+y+z & 5^{x-4} \end{bmatrix}_{2x2} \Rightarrow z = ?$

-8

6. $I = \begin{bmatrix} x-y & x-2y \\ 0 & x+y+z \end{bmatrix}_{2x2} \Rightarrow z = ?$

-2

7. $I = \begin{bmatrix} a-1 & 0 & 0 \\ 0 & b+2 & 0 \\ 0 & 0 & c-3 \end{bmatrix}_{3x3} \Rightarrow a \cdot b \cdot c = ?$

-8

ÖZELLİK | Property 3

İki Matrisin Eşitliği | Equality of Two Matrices

İki matrisin eşit olabilmesi için aynı satır ve sütun sayısından oluşması gerekir. Ayrıca karşılıklı elemanları da birbirine eşit olmalıdır.

Two matrices can be equal if their number of rows and columns are equal. Also the opposing elements should be equal to each other.

$$A = [a_{ij}]_{mxn}$$

$$B = [b_{ij}]_{mxn}$$

$$A = B \Leftrightarrow a_{ij} = b_{ij} \begin{cases} 1 \le i \le m \\ 1 \le j \le n \end{cases}$$

1. $\begin{bmatrix} a & b \\ c & d \end{bmatrix}_{2x2} = \begin{bmatrix} -1 & 2 \\ -3 & 4 \end{bmatrix}_{2x2}$

$\Rightarrow a \cdot b + c \cdot d = ?$

$\boxed{-14}$

2. $\begin{bmatrix} x-1 & y-2 & z+3 \end{bmatrix}_{1x3} = \begin{bmatrix} 7 & 4 & 8 \end{bmatrix}_{1x3}$

$\Rightarrow x + y + z = ?$

$\boxed{19}$

3. $\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}_{2x2} = \begin{bmatrix} a-1 & b \\ c+1 & d-2 \end{bmatrix}_{2x2}$

$\Rightarrow a + b + c + d = ?$

$\boxed{12}$

4. $\begin{bmatrix} a \\ b-2 \\ a+b+c \end{bmatrix}_{3x1} = \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}_{3x1} \Rightarrow c = ?$

$\boxed{-2}$

5. $\begin{bmatrix} \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \end{bmatrix}_{(a-1)x(b+2)} = \begin{bmatrix} \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \end{bmatrix}_{4x5}$

$\Rightarrow a \cdot b = ?$

$\boxed{15}$

6. $\begin{bmatrix} \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \end{bmatrix}_{(a+4)x6} = \begin{bmatrix} \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots \end{bmatrix}_{5x(b-2)}$

$\Rightarrow a + b = ?$

$\boxed{9}$

7. $\begin{bmatrix} x+y & x-2y \\ x & y \end{bmatrix}_{2x2} = \begin{bmatrix} 5 & -1 \\ c+1 & d-1 \end{bmatrix}_{2x2}$

$\Rightarrow c \cdot d = ?$

$\boxed{6}$

8. $\begin{bmatrix} x-1 & 0 & 0 \\ 0 & y+1 & 0 \\ 0 & 0 & z-3 \end{bmatrix}_{3x3} = I_{3x3} \Rightarrow x + y + z = ?$

$\boxed{6}$

9. $\begin{bmatrix} a-b \\ a+b \\ 2 \cdot a \cdot b \end{bmatrix}_{3x1} = \begin{bmatrix} 2a-3b \\ 6 \\ c \end{bmatrix}_{3x1} \Rightarrow c = ?$

$\boxed{16}$

ÖZELLİK | Property 4

Bir Matrisin Reel Sayı ile Çarpımı
Multiplication of a Real Number with Matrix

$$k \in R$$

$$A = [a_{ij}]_{mxn}$$

$$k \cdot A = [k \cdot a_{ij}]_{mxn}$$

Bir matris bir reel sayı ile çarpılırsa her bir eleman o sayıyla çarpılır.

If a matrix is multiplied by a real number, all of the elements will be multiplied by that number.

İki Matrisin Toplamı ve Farkı
Addition and Subtraction of Two Matrices

İki matrisin toplanabilmesi ve çıkarılabilmesi için satır ve sütun sayıları aynı olmalıdır. Toplama işleminde karşılıklı elemanlar toplanır. Çıkarma işleminde karşılıklı elemanlar çıkarılır.

To be able to add or subtract two matrices their numbers of rows and columns should be equal. In addition/subtraction operations the opposing elements will be added/subtracted.

$$A = [a_{ij}]_{mxn}$$

$$B = [b_{ij}]_{mxn}$$

$$A + B = [a_{ij} + b_{ij}]_{mxn}$$

$$A - B = [a_{ij} - b_{ij}]_{mxn}$$

1. $A = \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} -2 & -3 \\ 4 & 1 \end{bmatrix}_{2x2}$

$\Rightarrow A + B = ?$

$\begin{bmatrix} -1 & 0 \\ 8 & 3 \end{bmatrix}_{2x2}$

2. $A = \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}_{3x1}$ $B = \begin{bmatrix} -2 \\ -1 \\ 3 \end{bmatrix}_{3x1}$

$\Rightarrow A - B = ?$

$\begin{bmatrix} 3 \\ 4 \\ 1 \end{bmatrix}_{3x1}$

3. $A = \begin{bmatrix} 3 & 1 & 2 \\ 4 & -1 & 0 \end{bmatrix}_{2x3}$ $B = \begin{bmatrix} -1 & 0 & 2 \\ 3 & 1 & 4 \end{bmatrix}_{2x3}$

$\Rightarrow 2A - B = ?$

$\begin{bmatrix} 7 & 2 & 2 \\ 5 & -3 & -4 \end{bmatrix}_{2x3}$

4. $A = \begin{bmatrix} 1 & 4 \\ 3 & -1 \end{bmatrix}_{2x2}$

$\Rightarrow A + 2I = ?$

$\begin{bmatrix} 3 & 4 \\ 3 & 1 \end{bmatrix}_{2x2}$

5. $A = \begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} 3 & 4 \\ -1 & 2 \end{bmatrix}_{2x2}$

$\Rightarrow 2A - 3B = ?$

$\begin{bmatrix} -5 & -14 \\ 9 & -6 \end{bmatrix}_{2x2}$

6. $A = \begin{bmatrix} -1 & 0 & 2 \\ 3 & 0 & 1 \\ -1 & 0 & 2 \end{bmatrix}_{3x3}$

$\Rightarrow 2A + 3I = ?$

$\begin{bmatrix} 1 & 0 & 4 \\ 6 & 3 & 2 \\ -2 & 0 & 7 \end{bmatrix}_{3x3}$

7. $A = \begin{bmatrix} -1 \\ 0 \\ 2 \end{bmatrix}_{3x1}$ $B = \begin{bmatrix} x \\ y \\ z \end{bmatrix}_{3x1}$ $C = \begin{bmatrix} -3 \\ 0 \\ 0 \end{bmatrix}_{3x1}$

$A - 2B = C$

$\Rightarrow B = ?$

$\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}_{3x1}$

8. $A = \begin{bmatrix} 3 & 2 \\ 6 & 0 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}_{2x2}$

$A + 2B = I$

$\Rightarrow B = ?$

$\begin{bmatrix} -1 & -1 \\ -3 & \frac{1}{2} \end{bmatrix}_{2x2}$

ÖZELLİK | Property 5

İki Matrisin Çarpımı
Multiplied of Two Matrices

A · B matrisinin tanımlı olabilmesi için A matrisinin sütun sayısı B matrisinin satır sayısına eşit olmalıdır.

To define A · B matrixes, the number of column of A matrix should be equal to the number of row of B matrix.

$$A = [a_{ij}]_{mxn}$$

$$B = [b_{ij}]_{nxp}$$

$$C = A \cdot B = [a_{ij}]_{mxn} \cdot [b_{jk}]_{nxp} = [c_{ik}]_{mxp}$$

$$c_{ik} = \sum_{j=1}^{n} a_{ij} b_{jk}$$

İlk matrisin i. satırı, ikinci matrisin k. sütunuyla sırayla çarpılıp toplanırsa çarpım matrisin i. satır, k. sütun elemanı bulunur.

If i. row of first matrix, and k. column of second matrix are multiplied and then added respectively, the element of i row and k column will be found.

1. $A = \begin{bmatrix} 1 & 2 \end{bmatrix}_{1x2}$ $B = \begin{bmatrix} 1 \\ 3 \end{bmatrix}_{2x1}$ $\Rightarrow A \cdot B = ?$

$\begin{bmatrix} 7 \end{bmatrix}_{1x1}$

2. $A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} 1 \\ 3 \end{bmatrix}_{2x1}$ $\Rightarrow A \cdot B = ?$

$\begin{bmatrix} 7 \\ 6 \end{bmatrix}_{2x1}$

3. $A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} -2 & 1 \\ 1 & 2 \end{bmatrix}_{2x2}$

$\Rightarrow A \cdot B = ?$

$\begin{bmatrix} 4 & 3 \\ -2 & 11 \end{bmatrix}_{2x2}$

4. $A = \begin{bmatrix} -1 & 0 \\ 2 & 4 \end{bmatrix}_{2x2}$ $\Rightarrow A^2 = ?$

$\begin{bmatrix} 1 & 0 \\ 6 & 16 \end{bmatrix}_{2x2}$

5. $A = \begin{bmatrix} 3 & 1 & 3 \\ 2 & 1 & 1 \end{bmatrix}_{2x3}$ $B = \begin{bmatrix} -1 & 3 \\ 1 & 1 \\ 2 & 2 \end{bmatrix}_{3x2}$ $\Rightarrow A \cdot B = ?$

$\begin{bmatrix} 4 & 16 \\ 1 & 9 \end{bmatrix}_{2x2}$

6. $A = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}_{3x4}$ $B = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}_{axb}$ $C = \begin{bmatrix} \cdots & \cdots \\ \cdots & \cdots \end{bmatrix}_{cx2}$

$A \cdot B = C \Rightarrow a + b + c = ?$

9

7. $\begin{bmatrix} 1 & 2 & -1 & 3 \\ 4 & 0 & 2 & 1 \\ -1 & 3 & 4 & 1 \\ 0 & -1 & 2 & 3 \end{bmatrix}_{4x4} \cdot \begin{bmatrix} -1 & 2 \\ 3 & 1 \\ 0 & 2 \\ 1 & 0 \end{bmatrix}_{4x2} = \begin{bmatrix} a & b \\ c & d \\ e & f \\ g & h \end{bmatrix}_{4x2}$

$\Rightarrow c + f = ?$

6

ÖZELLİK | Property 6

Bir Matrisin Tersi | Inverse Matrix

$$A = [a_{ij}]_{nxn}$$
$$A \cdot B = B \cdot A = I$$

olacak şekilde B matrisi varsa B'ye, A matrisinin tersi denir ve A^{-1} ile gösterilir.

If there is B matrix as above, B is called the inverse of matrix A and its shown like A^{-1}.

$$A \cdot A^{-1} = A^{-1} \cdot A = I$$

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$A^{-1} = \frac{1}{ad - bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$ad - bc = 0 \Rightarrow A^{-1}$ yoktur. *(then there is not A^{-1})*

- $(A^{-1})^{-1} = A$
- $I^{-1} = I$
- $A \cdot X = B \Rightarrow X = A^{-1} \cdot B$
- $X \cdot A = B \Rightarrow X = B \cdot A^{-1}$

1. $A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}_{2x2}$ $\Rightarrow A^{-1} = ?$

$\begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix}_{2x2}$

2. $A = \begin{bmatrix} 4 & 2 \\ 2 & 2 \end{bmatrix}_{2x2}$ $\Rightarrow A^{-1} = ?$

$\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & 1 \end{bmatrix}_{2x2}$

3. $A = \begin{bmatrix} 6 & 2 \\ 2 & 1 \end{bmatrix}_{2x2}$ $\Rightarrow A^{-1} = ?$

$\begin{bmatrix} \frac{1}{2} & -1 \\ -1 & 3 \end{bmatrix}_{2x2}$

4. $A = \begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} 2 & 1 \\ 2 & 2 \end{bmatrix}_{2x2}$

$\Rightarrow A \cdot B^{-1} = ?$

$\begin{bmatrix} 0 & \frac{1}{2} \\ 1 & 0 \end{bmatrix}_{2x2}$

5. $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}_{2x2}$

$\Rightarrow (A \cdot B)^{-1} = ?$

$\begin{bmatrix} -4 & 7 \\ 7 & -12 \end{bmatrix}_{2x2}$

6. $A = \begin{bmatrix} 4 & 2 \\ 8 & x \end{bmatrix}_{2x2}$

A matrisinin tersi yoksa x kaçtır?

If there is no inverse matrix then what is the value of "x"?

4

7. $A \cdot \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}_{2x2} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}_{2x2}$ $\Rightarrow A = ?$

$\begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix}_{2x2}$

8. $\begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}_{2x2} \cdot A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}_{2x2}$ $\Rightarrow A = ?$

$\begin{bmatrix} -3 & -1 \\ 2 & 1 \end{bmatrix}_{2x2}$

ÖZELLİK | Property 7

I Birim Matris *(I, Identity Matrix)*

- $A \cdot I = A$
- $I \cdot A = A$
- $A \cdot B \neq B \cdot A$
- $A \cdot (B \cdot C) = (A \cdot B) \cdot C$

$n \in N$

- $I^n = I$
- $A^2 = A \cdot A$
- $A^n = \underbrace{A \cdot A \cdot A \cdot \ldots\ldots \cdot A}_{\text{n tane } (n \text{ times})}$
- $A = \begin{bmatrix} 1 & 0 \\ k & 1 \end{bmatrix} \Rightarrow A^n = \begin{bmatrix} 1 & 0 \\ n \cdot k & 1 \end{bmatrix}$
- $A = \begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix} \Rightarrow A^n = \begin{bmatrix} 1 & n \cdot k \\ 0 & 1 \end{bmatrix}$
- $A = \begin{bmatrix} -1 & 0 \\ k & 1 \end{bmatrix} \Rightarrow \begin{cases} A^{2n} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \\ A^{2n-1} = A \end{cases}$
- $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \Rightarrow A^n = 2^{n-1} \cdot A$

1. $A = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}_{2x2} \Rightarrow A^{40} = ?$

$\begin{bmatrix} 1 & 0 \\ 120 & 1 \end{bmatrix}_{2x2}$

2. $A = \begin{bmatrix} 1 & 4 \\ 0 & 1 \end{bmatrix}_{2x2} \Rightarrow A^{20} = ?$

$\begin{bmatrix} 1 & 80 \\ 0 & 1 \end{bmatrix}_{2x2}$

3. $A = \begin{bmatrix} 1 & 3 \\ 0 & -1 \end{bmatrix}_{2x2} \Rightarrow A^{40} = ?$

I

4. $A = \begin{bmatrix} -1 & 0 \\ 4 & 1 \end{bmatrix}_{2x2} \Rightarrow A^{21} = ?$

A

5. $f(x) = x^2 - 2$

$A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}_{2x2} \Rightarrow f(A) = ?$

$\begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}_{2x2}$

6. $A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}_{2x2} \Rightarrow A^{10} = ?$

$2^{18} \cdot A$

7. $A = \begin{bmatrix} 2 & 0 \\ 4 & -2 \end{bmatrix}_{2x2} \Rightarrow A^{40} = ?$

$2^{40} \cdot I$

8. $A = \begin{bmatrix} 2 & 0 \\ 6 & 2 \end{bmatrix}_{2x2} \Rightarrow A^{30} = ?$

$2^{30} \cdot \begin{bmatrix} 1 & 0 \\ 90 & 1 \end{bmatrix}_{2x2}$

9. $A = \begin{bmatrix} 3 & 0 \\ 0 & 4 \end{bmatrix}_{2x2} \Rightarrow A^{20} = ?$

$\begin{bmatrix} 3^{20} & 0 \\ 0 & 4^{20} \end{bmatrix}_{2x2}$

ÖZELLİK | Property 8

$$A = [a_{ij}]_{mxn}$$

matrisinin satırlarını sütun veya sütunlarını satır haline getirerek oluşturulan matrise A'nın transpozu denir.

The formation of a matrix by converting the columns of a matrix to rows and the rows to columns is called transpose of A matrix.

$$A = [a_{ij}]_{mxn} \Rightarrow A^T = [a_{ij}]_{nxm}$$

$A = A^T \Rightarrow$ A'ya simetrik matris denir.

A is called symmetric matrix

- $(A^T)^T = A$
- $(A \pm B)^T = A^T \pm B^T$
- $(A \cdot B)^T = B^T \cdot A^T$
- $(k \cdot A)^T = k \cdot A^T \qquad k \in R$
- $(A^{-1})^T = (A^T)^{-1}$

1. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2x2} \qquad \Rightarrow A^T = ?$

$\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}_{2x2}$

2. $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 4 \end{bmatrix}_{2x3} \qquad \Rightarrow A^T = ?$

$\begin{bmatrix} 1 & -1 \\ 2 & 0 \\ 3 & 4 \end{bmatrix}_{3x2}$

3. $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}_{3x1} \qquad B = \begin{bmatrix} 2 & 0 & 4 \end{bmatrix}_{1x3} \qquad \Rightarrow A^T + B = ?$

$\begin{bmatrix} 1 & 2 & 7 \end{bmatrix}_{1x3}$

4. $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}_{2x2} \qquad B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}_{2x2}$

$\Rightarrow A^T \cdot B = ?$

$\begin{bmatrix} 1 & 4 \\ 1 & 8 \end{bmatrix}_{2x2}$

5. $A = \begin{bmatrix} 1 & -2 & 0 \\ 1 & 3 & 4 \\ -2 & 0 & 1 \end{bmatrix}_{3x3} \qquad B^T = \begin{bmatrix} -1 & -2 & 3 \\ 4 & 0 & 1 \\ 2 & 1 & 4 \end{bmatrix}_{3x3}$

$\Rightarrow A^T + B = ?$

$\begin{bmatrix} 0 & 5 & 0 \\ -4 & 3 & 1 \\ 3 & 5 & 5 \end{bmatrix}_{3x3}$

6. $A = \begin{bmatrix} -1 & 0 & 3 \\ 2 & 1 & 1 \end{bmatrix}_{2x3} \qquad B = \begin{bmatrix} 4 & 1 \\ 0 & -1 \\ 0 & 3 \end{bmatrix}_{3x2}$

$\Rightarrow A^T + B = ?$

$\begin{bmatrix} 3 & 3 \\ 0 & 0 \\ 3 & 4 \end{bmatrix}_{3x2}$

7. $A = \begin{bmatrix} 1 & -4 \\ 3 & 0 \end{bmatrix}_{2x2} \qquad B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix}_{2x2}$

$A + B^T = C \Rightarrow C = ?$

$\begin{bmatrix} 2 & -4 \\ 6 & 2 \end{bmatrix}_{2x2}$

ÖZELLİK | Property 9

Determinant, kare matrisleri bir sayıya eşleyen fonksiyondur. Determinant fonksiyonunun, kare matrisi eşlediği o sayıya matrisin determinantı denir. $|A|$ ve detA sembolü ile gösterilir.

Determinant is a function which matches a square matrix to a number. The number which is matched with the square matrix by determinant function is called determinant of matrix and is shown $|A|$ and detA.

- $A = \begin{bmatrix} a \end{bmatrix}_{1x1} \Rightarrow |A| = a$
- $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}_{2x2} \Rightarrow |A| = ad - bc$
- $A = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & k \end{bmatrix}$ Sarrus Kuralı *(Sarrus Rule)*

$$|A| = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & k \end{vmatrix} \begin{matrix} - \\ - \\ - \end{matrix} \quad \begin{matrix} a & b & c & + \\ d & e & f & + \\ & & & + \end{matrix}$$

$|A| = a \cdot e \cdot k + d \cdot h \cdot c + g \cdot b \cdot f - g \cdot e \cdot c - a \cdot h \cdot f - d \cdot b \cdot k$

1. $A = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}_{2x2} \Rightarrow \det(A) = ?$

$\boxed{-5}$

2. $A = \begin{bmatrix} -1 & 2 \\ 3 & 3 \end{bmatrix}_{2x2} \Rightarrow |A| = ?$

$\boxed{-9}$

3. $A = \begin{bmatrix} x & x+2 \\ x-1 & x \end{bmatrix}_{2x2}$ $|A| = 5 \Rightarrow x = ?$

$\boxed{-3}$

4. $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 1 & 1 \\ -1 & 2 & 3 \end{bmatrix}_{3x3} \Rightarrow |A| = ?$

$\boxed{-26}$

5. $\begin{vmatrix} 4 & 3 & 0 \\ 2 & 1 & -1 \\ -1 & 0 & 2 \end{vmatrix} = ?$

$\boxed{-1}$

6. $\begin{vmatrix} 200 & 201 \\ 202 & 203 \end{vmatrix} = ?$

$\boxed{-2}$

7. $A = \begin{bmatrix} x & 1 & 1 \\ 1 & 2 & 1 \\ 3 & 0 & 1 \end{bmatrix}_{3x3}$ $|A| = -2 \Rightarrow x = ?$

$\boxed{1}$

8. $\begin{vmatrix} 1 & -2 & 1 \\ 3 & 4 & 0 \\ 0 & 1 & x \end{vmatrix} = 23 \Rightarrow x = ?$

$\boxed{2}$

ÖZELLİK | Property 10

Kare bir A matrisinin i. satır ve j. sütunu atıldıktan sonra geriye kalan elemanların oluşturduğu matrisin determinantına a_{ij} elemanının minörü denir ve M_{ij} ile gösterilir.

a_{ij} elemanına ait minörün $(-1)^{i+j}$ ile çarpımına a_{ij} elemanının kofaktörü denir ve A_{ij} ile gösterilir.

Kofaktör yardımıyla 3x3 veya daha büyük boyutlu kare matrislerin determinantı hesaplanabilir. Kare bir matrisin determinantı, herhangi bir satırındaki veya sütunundaki elemanları ile kofaktörlerinin çarpımı toplanarak bulunur.

The determinant of the matrix which is formed by the elements remained after deleting the i row and j column of a square A matrix is called the minor of the a_{ij} and is shown as M_{ij}.

The multiplication of the minor of aij by $(-1)^{i+j}$ is called cofactor of a_{ij} element and is shown as A_{ij}.

With help of cofactor the determinant of 3x3 or greater square matrices could be calculated. To find the determinant of a square matrix, the elements on any row and column and their cofactors will be multiplied and then added.

$$A = [a_{ij}]_{3x3}$$

1. satıra göre *(according to row 1)*

$$|A| = a_{11} \cdot A_{11} + a_{12} \cdot A_{12} + a_{13} \cdot A_{13}$$

2. sütuna göre *(according to column 2)*

$$|A| = a_{12} \cdot A_{12} + a_{22} \cdot A_{22} + a_{32} \cdot A_{32}$$

1. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2x2}$ $\Rightarrow M_{11} = ?$

4

2. $A = \begin{bmatrix} -3 & 4 \\ -1 & 5 \end{bmatrix}_{2x2}$ $\Rightarrow M_{12} = ?$

– 1

3. $A = \begin{bmatrix} 9 & 5 \\ 7 & 4 \end{bmatrix}_{2x2}$ $\Rightarrow A_{12} = ?$

–7

4. $A = \begin{bmatrix} 3 & 1 \\ -2 & 4 \end{bmatrix}_{2x2}$ $\Rightarrow A_{22} = ?$

3

5. $A = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 3 & 4 \\ -2 & 1 & 5 \end{bmatrix}_{3x3}$ $\Rightarrow M_{22} = ?$

3

6. $A = \begin{bmatrix} -1 & 3 & 2 \\ -4 & 0 & 1 \\ -3 & -2 & 0 \end{bmatrix}_{3x3}$ $\Rightarrow A_{32} = ?$

–7

7. $A = \begin{bmatrix} 1 & 3 & 2 \\ 0 & 4 & -1 \\ 2 & 1 & 3 \end{bmatrix}_{3x3}$ $\Rightarrow |A| = ?$

– 9

8. $A = \begin{bmatrix} -1 & 0 & 2 & 0 \\ -1 & 3 & 0 & 1 \\ 2 & -1 & 1 & 4 \\ 1 & 0 & 3 & 2 \end{bmatrix}_{4x4}$ $\Rightarrow |A| = ?$

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ÖZELLİK | Property 11

Determinantın Özellikleri | Properties of Determinant

- Bir satır veya bir sütunun tüm elemanları sıfır ise matrisin determinantı sıfırdır.

  If all of the elements of a column or row are zero then the determinant will be zero as well.

- Herhangi iki satır veya sütunun elemanları eşit olan matrisin determinantı sıfırdır.

  If the elements of two column or rows of a matrix are equal then the determinant will be zero.

- Herhangi iki satır veya sütununun elemanları orantılı ise (lineer bağımlı) matrisin determinantı sıfırdır.

  If the elements of two columns or rows of a matrix are proportional then its determinant will be zero.

- Herhangi iki satır veya sütun yer değiştirirse determinantın işareti değişir.

  If two rows or columns exchange places the sign of the determinant will change.

- Bir matrisin bir satır veya sütunu $k \in R$ ile çarpılınca oluşan matrisin determinantı ilk matrisin determinantının k ile çarpımına eşittir.

  The determinant occurred after the multiplication of a row or a column of a matrix by $k \in R$ is equal to the multiplication of the first matrix by k.

- Bir matrisin herhangi bir satır veya sütunu $k \in R$ ile çarpılıp diğer bir satır veya sütuna eklenirse determinantın sonucu değişmez.

  If a row or a column of a matrix is multiplied by $k \in R$ and added to another row or column the result of the determinant will remain unchanged.

- $|A| = |A^T|$
- $|A \cdot B| = |A| \cdot |B|$
- $|A^n| = |A|^n \qquad n \in N$
- $|A^{-1}| = |A|^{-1} \qquad |A| \neq 0$
- $A = [a_{ij}]_{nxn} \qquad |A| = t$

  $k \in R \Rightarrow |k \cdot A| = k^n \cdot t$

- $\begin{vmatrix} a & b & c \\ d & e & f \\ x & y & z \end{vmatrix} + \begin{vmatrix} a & b & c \\ d & e & f \\ m & n & k \end{vmatrix} = \begin{vmatrix} a & b & c \\ d & e & f \\ x+m & y+n & z+k \end{vmatrix}$

1. $\begin{vmatrix} 1 & 0 & 4 \\ 2 & 0 & 2 \\ 3 & 0 & 1 \end{vmatrix} = ?$

0

2. $\begin{vmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -4 & 2 & 1 \end{vmatrix} = ?$

0

3. $\begin{vmatrix} 2 & 1 & 3 \\ 2 & 1 & 3 \\ 5 & -1 & 6 \end{vmatrix} = ?$

0

4. $\begin{vmatrix} -1 & -2 & 1 \\ 2 & 4 & 2 \\ 3 & 6 & 3 \end{vmatrix} = ?$

0

5. $\begin{vmatrix} 4 & 2 & -2 \\ 2 & 1 & -1 \\ 3 & 0 & 5 \end{vmatrix} = ?$

0

6. $\begin{vmatrix} 3 & x \\ 4 & 2 \end{vmatrix} = t \Rightarrow \begin{vmatrix} 3 & 4 \\ x & 2 \end{vmatrix} = ?$

t

7. $\begin{vmatrix} 2 & 1 & 3 \\ 1 & 2 & 4 \\ 6 & 5 & 2 \end{vmatrix} = t \Rightarrow \begin{vmatrix} 1 & 2 & 4 \\ 2 & 1 & 3 \\ 6 & 5 & 2 \end{vmatrix} = ?$

−t

8. $\begin{vmatrix} 2 & 1 & 3 \\ -1 & 0 & 1 \\ 1 & 3 & x \end{vmatrix} = t \Rightarrow \begin{vmatrix} -1 & 0 & 1 \\ 1 & 3 & x \\ 2 & 1 & 3 \end{vmatrix} = ?$

t

9. $\begin{vmatrix} 3 & x & 4 \\ 2 & 4 & 1 \\ 1 & -1 & 3 \end{vmatrix} = t \Rightarrow \begin{vmatrix} 3 & 2 & 1 \\ x & 4 & -1 \\ 4 & 1 & 3 \end{vmatrix} = ?$

t

10. $\begin{vmatrix} 2 & -1 & x \\ x & 2 & 1 \\ -1 & 3 & 4 \end{vmatrix} = t \Rightarrow \begin{vmatrix} -1 & x & 2 \\ 2 & 1 & x \\ 3 & 4 & -1 \end{vmatrix} = ?$

t

11. $\begin{vmatrix} x & 1 \\ 2 & 3 \end{vmatrix} = t \Rightarrow \begin{vmatrix} 2x & 2 \\ 2 & 3 \end{vmatrix} = ?$

2t

12. $\begin{vmatrix} x & 2 \\ -1 & 3 \end{vmatrix} = t \Rightarrow \begin{vmatrix} 2x & 12 \\ -1 & 9 \end{vmatrix} = ?$

6t

13. $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 2 & 1 \\ 5 & 4 & 7 \end{vmatrix} = t \Rightarrow \begin{vmatrix} 2 & 2 & 3 \\ 8 & 2 & 1 \\ 10 & 4 & 7 \end{vmatrix} = ?$

2t

14. $\begin{vmatrix} 2 & 1 & 4 \\ 3 & 1 & 2 \\ 4 & 6 & 1 \end{vmatrix} = t \Rightarrow \begin{vmatrix} 4 & 2 & 8 \\ 9 & 3 & 6 \\ 4 & 6 & 1 \end{vmatrix} = ?$

6t

15. $\begin{vmatrix} 3 & 3 & 1 \\ 4 & 7 & 2 \\ 10 & 13 & 4 \end{vmatrix} = ?$

0

16. $\begin{vmatrix} 23 & 27 & 30 \\ 25 & 29 & 32 \\ 30 & 34 & 37 \end{vmatrix} = ?$

0

17. $A = [a_{ij}]_{2x2}$

$|A| = 4$

$\Rightarrow |3A| = ?$

36

18. $A = [a_{ij}]_{3x3}$

$|A| = x$

$\Rightarrow |2A| = ?$

8x

19. $A = [a_{ij}]_{3x3}$

$|A| = x$

$\Rightarrow |3A| = ?$

27x

20. $\begin{vmatrix} 1 & 2 & -1 \\ 0 & 3 & 2 \\ -1 & 2 & 0 \end{vmatrix} + \begin{vmatrix} 1 & 2 & -1 \\ 0 & 3 & 2 \\ 4 & -1 & 1 \end{vmatrix} = ?$

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1. $A = \begin{bmatrix} 1 & 7 & 4 \\ 5 & 2 & 9 \end{bmatrix}_{mxn}$

$\Rightarrow mxn = ?$

A) 1 x 4 B) 2 x 2 C) 2 x 3 D) 3 x 2 E) 2 x 4

2. $A = \begin{bmatrix} 0 & 7 & 4 & 6 \\ 2 & 3 & 1 & 9 \\ 11 & 2 & 5 & 8 \end{bmatrix}_{mxn}$

$\Rightarrow mxn = ?$

A) 2 x 3 B) 3 x 3 C) 3 x 4 D) 4 x 3 E) 4 x 4

3. $A = \begin{bmatrix} 1 & 7 & 2 \\ 8 & 3 & 4 \\ 6 & 7 & 9 \end{bmatrix}_{3x3}$ $A = [a_{ij}]_{3x3}$

$\Rightarrow a_{21} + a_{32} = ?$

A) 11 B) 12 C) 14 D) 15 E) 16

4. $A = \begin{bmatrix} 10 & 0 & 2 & 3 \\ 12 & 4 & 1 & 9 \\ 3 & 20 & 5 & 8 \\ 6 & 5 & 6 & 4 \end{bmatrix}_{4x3}$ $A = [a_{ij}]_{4x3}$

$\Rightarrow a_{23} + a_{31} + a_{43} = ?$

A) 10 B) 11 C) 17 D) 30 E) 38

5. $I = \begin{bmatrix} 1 & 0 & 0 \\ a & b & c \\ e & 0 & d \end{bmatrix}_{3x3}$ I birim matris

I identity matrix

$\Rightarrow a + b + c + d + e = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

6. $I = \begin{bmatrix} a & 0 & d \\ 0 & c & e \\ b & 0 & f \end{bmatrix}_{3x3}$ I birim matris

I identity matrix

$\Rightarrow 3a + 2c - 2b + d - f = ?$

A) 0 B) 2 C) 4 D) 5 E) 6

7. $A_{ij} = [a_{ij}]_{2x2}$ $a_{ij} = i \cdot j$

$\Rightarrow A = ?$

A) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 0 & 1 \\ 0 & 2 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$

8. $A_{ij} = [a_{ij}]_{3x3}$ $a_{ij} = i + j$

$\Rightarrow A = ?$

A) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & 1 \\ 2 & 1 & 0 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix}$ E) $\begin{bmatrix} 0 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 0 \end{bmatrix}$

9. $A=\begin{bmatrix}4&1&5\\a&3&0\\2&b&6\end{bmatrix}_{3x3}$ $B=\begin{bmatrix}c&1&5\\1&3&0\\2&4&d\end{bmatrix}_{3x3}$

$A=B \Rightarrow a+b+c+d=?$

A) 13 B) 15 C) 17 D) 19 E) 21

10. $A=\begin{bmatrix}x&2&6\\0&y&4\\1&4&0\\3&5&z\end{bmatrix}_{4x3}$ $B=\begin{bmatrix}2&2&t\\0&4&4\\1&4&0\\3&5&1\end{bmatrix}_{4x3}$

$A=B \Rightarrow x+y+z+t=?$

A) 13 B) 15 C) 17 D) 19 E) 21

11. $\begin{bmatrix}2^x&2^{x+1}\\3^y&3^{y-2}\end{bmatrix}=\begin{bmatrix}2^m&32\\3^n&27\end{bmatrix}$

$\Rightarrow m\cdot n=?$

A) 4 B) 8 C) 12 D) 16 E) 20

12. $\begin{bmatrix}4&x&2\\2^x&2^y&4\\5&8&3y^2\end{bmatrix}=\begin{bmatrix}4&3&2\\a&b&4\\5&8&48\end{bmatrix}$

$\Rightarrow x+y+a+b=?$

A) 15 B) 23 C) 28 D) 31 E) 48

13. $\begin{bmatrix}2a+b&c+3d\\a-b&c-d\end{bmatrix}=\begin{bmatrix}10&12\\-1&4\end{bmatrix}$

$\Rightarrow a\cdot b+c\cdot d=?$

A) 8 B) 12 C) 16 D) 20 E) 24

14. $a, b, c \in Z^+$

$\begin{bmatrix}\frac{a}{b}&6\\c-3&a\cdot b\end{bmatrix}=\begin{bmatrix}4&6\\2&16\end{bmatrix}$

$\Rightarrow 2a-4b+c=?$

A) 10 B) 11 C) 12 D) 13 E) 14

15. $\begin{bmatrix}x-y&0&2\\1&3&z-v\\y-z&4&1\end{bmatrix}=\begin{bmatrix}10&0&2\\1&3&4\\5&4&1\end{bmatrix}$

$\Rightarrow x-v=?$

A) 18 B) 19 C) 20 D) 21 E) 22

16. $\begin{bmatrix}x+y&0&3\\3&4&5\\7&y+z&12\end{bmatrix}=\begin{bmatrix}6&0&3\\3&x+z&5\\7&10&12\end{bmatrix}$

$\Rightarrow x+y+z=?$

A) 5 B) 10 C) 15 D) 20 E) 30

1. $A=\begin{bmatrix}1 & -3 & 0\\ 2 & 4 & -1\end{bmatrix}$ $B=\begin{bmatrix}4 & 2 & 3\\ -2 & -1 & 2\end{bmatrix}$

$\Rightarrow A+B=?$

A) $\begin{bmatrix}5 & -1 & 3\\ 0 & 3 & 1\end{bmatrix}$ B) $\begin{bmatrix}5 & -1 & 3\\ 1 & -3 & -1\end{bmatrix}$ C) $\begin{bmatrix}5 & 1 & 3\\ 0 & 3 & -1\end{bmatrix}$ D) $\begin{bmatrix}5 & 1 & 3\\ 2 & 4 & 1\end{bmatrix}$ E) $\begin{bmatrix}3 & -1 & 3\\ 2 & 4 & 1\end{bmatrix}$

2. $A=\begin{bmatrix}3 & 2 & 0\\ 4 & 5 & 3\\ 2 & -2 & 1\\ 0 & 1 & 0\end{bmatrix}$ $B=\begin{bmatrix}4 & 5 & 0\\ 3 & -2 & 1\\ -1 & 5 & 0\\ 2 & 3 & 3\end{bmatrix}$

$\Rightarrow A+B=?$

A) $\begin{bmatrix}7 & 7 & 1\\ 1 & 3 & 4\\ 2 & 3 & 1\\ 2 & 5 & 3\end{bmatrix}$ B) $\begin{bmatrix}1 & 7 & 0\\ 1 & 3 & 4\\ 1 & 5 & 3\\ 2 & 3 & 1\end{bmatrix}$ C) $\begin{bmatrix}7 & 5 & 0\\ 7 & 2 & 4\\ 2 & 3 & 3\\ 2 & 5 & 1\end{bmatrix}$ D) $\begin{bmatrix}7 & 7 & 0\\ 7 & 3 & 4\\ 1 & 3 & 1\\ 2 & 4 & 3\end{bmatrix}$ E) $\begin{bmatrix}1 & 7 & 0\\ 1 & 3 & 4\\ 1 & 5 & 3\\ 2 & 3 & 1\end{bmatrix}$

3. $A=\begin{bmatrix}4 & 3\\ -2 & 5\end{bmatrix}$ $B=\begin{bmatrix}-2 & -6\\ -5 & 1\end{bmatrix}$

$\Rightarrow A-B=?$

A) $\begin{bmatrix}6 & 9\\ -7 & 4\end{bmatrix}$ B) $\begin{bmatrix}2 & 9\\ 3 & 4\end{bmatrix}$ C) $\begin{bmatrix}2 & 9\\ 3 & 4\end{bmatrix}$ D) $\begin{bmatrix}6 & 9\\ -7 & 3\end{bmatrix}$ E) $\begin{bmatrix}6 & 9\\ 3 & 4\end{bmatrix}$

4. $A=\begin{bmatrix}8 & -3\\ 1 & 0\\ 3 & 2\end{bmatrix}$ $B=\begin{bmatrix}10 & 0\\ 4 & 2\\ 5 & 2\end{bmatrix}$

$\Rightarrow B-A=?$

A) $\begin{bmatrix}2 & 0\\ 3 & 2\\ 0 & 2\end{bmatrix}$ B) $\begin{bmatrix}2 & 3\\ 2 & 0\\ 0 & 2\end{bmatrix}$ C) $\begin{bmatrix}2 & 3\\ 3 & 2\\ 2 & 0\end{bmatrix}$ D) $\begin{bmatrix}2 & 0\\ 3 & 2\\ 2 & 0\end{bmatrix}$ E) $\begin{bmatrix}2 & 3\\ 2 & 0\\ 3 & 2\end{bmatrix}$

5. $\begin{bmatrix}a & -3\\ 4 & b\end{bmatrix}+\begin{bmatrix}-1 & 5\\ -c & 2\end{bmatrix}=\begin{bmatrix}2 & 2\\ 1 & 3\end{bmatrix}$

$\Rightarrow a\cdot b+c=?$

A) 2 B) 4 C) 5 D) 6 E) 8

6. $\begin{bmatrix}x+1 & 0\\ y-2 & 3\end{bmatrix}+\begin{bmatrix}4 & z\\ 0 & 2\end{bmatrix}=\begin{bmatrix}2 & 0\\ 3 & 5\end{bmatrix}$

$\Rightarrow x+y+z=?$

A) 0 B) 1 C) 2 D) 3 E) 4

7. $\begin{bmatrix}1 & 3 & b\\ 2a & -2 & 1\end{bmatrix}+\begin{bmatrix}-2 & 1 & a\\ -b & 2 & 3\end{bmatrix}=\begin{bmatrix}-1 & 4 & 9\\ 3 & 0 & 4\end{bmatrix}$

$\Rightarrow a\cdot b=?$

A) 5 B) 10 C) 15 D) 20 E) 25

8. $\begin{bmatrix} 2b & 3 \\ 2 & 4 \\ -1 & -2a \end{bmatrix} + \begin{bmatrix} -a & 0 \\ 2 & 3 \\ 1 & 2b \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 4 & 7 \\ 0 & 4 \end{bmatrix}$

$\Rightarrow a \cdot b = ?$

A) -3 B) -2 C) 1 D) 3 E) 6

9. $\begin{bmatrix} x & 3 \\ 4 & y \end{bmatrix} + \begin{bmatrix} y & 1 \\ 2 & -x \end{bmatrix} = \begin{bmatrix} 7 & 4 \\ 6 & 3 \end{bmatrix}$

$\Rightarrow x \cdot y = ?$

A) -10 B) -5 C) 0 D) 5 E) 10

10. $\begin{bmatrix} x+1 & 3 \\ 4 & 2y-2 \\ z & 2 \end{bmatrix} + \begin{bmatrix} 4-y & 2 \\ 2 & -x \\ 8 & 4 \end{bmatrix} = \begin{bmatrix} 10 & 5 \\ 6 & 2 \\ 2 & 6 \end{bmatrix}$

$\Rightarrow x+y+z = ?$

A) -6 B) -8 C) 3 D) 17 E) 29

11. $\begin{bmatrix} x-y \\ x-3 \end{bmatrix} + \begin{bmatrix} 2x+3y \\ y-1 \end{bmatrix} = \begin{bmatrix} x+y+4 \\ 2y+1 \end{bmatrix}$

$\Rightarrow x \cdot y = ?$

A) -6 B) -4 C) 4 D) 6 E) 8

12. $\begin{bmatrix} 2x+1 \\ y-1 \\ z+4 \end{bmatrix} - \begin{bmatrix} x+1 \\ -2y+3 \\ 3z \end{bmatrix} = \begin{bmatrix} 2x-6 \\ 5 \\ z+1 \end{bmatrix}$

$\Rightarrow x \cdot y \cdot z = ?$

A) -18 B) -6 C) -3 D) 6 E) 18

13. $\begin{bmatrix} \frac{1}{a} & 1 & \frac{1}{c} \\ 0 & \frac{1}{b} & \frac{2}{3} \end{bmatrix} + \begin{bmatrix} \frac{1}{b} & \frac{1}{2} & \frac{1}{a} \\ \frac{3}{2} & \frac{1}{c} & \frac{1}{3} \end{bmatrix} = \begin{bmatrix} \frac{1}{3} & \frac{3}{2} & \frac{1}{6} \\ \frac{3}{2} & \frac{1}{4} & 1 \end{bmatrix}$

$\Rightarrow b = ?$

A) $\frac{2}{3}$ B) $\frac{3}{4}$ C) $\frac{24}{5}$ D) $\frac{5}{12}$ E) $\frac{12}{5}$

14. $\begin{bmatrix} a \\ 2b \\ 2a \end{bmatrix} + \begin{bmatrix} 2b \\ 2c \\ -c \end{bmatrix} = \begin{bmatrix} 5 \\ 11 \\ 9 \end{bmatrix}$

$\Rightarrow c = ?$

A) -1 B) 1 C) 5 D) 7 E) 9

15. $A = [x_{ij}]_{axb}$
$B = [y_{ij}]_{cx4}$
$A + B = [(x_{ij} + y_{ij})]_{2xd}$
$\Rightarrow a + b + c + d = ?$

A) 4 B) 8 C) 12 D) 16 E) 64

16. $A = [x_{ij}]_{(a+1) \times 3}$
$B = [y_{ij}]_{4 \times (b-2)}$
$B - A = [(y_{ij} - x_{ij})]_{c \times d}$
$\Rightarrow a + b + c + d = ?$

A) 4 B) 7 C) 8 D) 15 E) 30

1. $A = \begin{bmatrix} 1 & -3 \\ 0 & 4 \end{bmatrix}_{2x2}$ $\Rightarrow 3A = ?$

A) $\begin{bmatrix} 3 & -3 \\ 0 & 4 \end{bmatrix}$ B) $\begin{bmatrix} 3 & -9 \\ 0 & 12 \end{bmatrix}$ C) $\begin{bmatrix} 3 & -9 \\ 0 & 4 \end{bmatrix}$

D) $\begin{bmatrix} 1 & -9 \\ 0 & 12 \end{bmatrix}$ E) $\begin{bmatrix} 3 & -3 \\ 0 & 12 \end{bmatrix}$

2. $A = \begin{bmatrix} 1 & 4 & 5 \\ 2 & 3 & 6 \end{bmatrix}_{2x3}$ $\Rightarrow -2A = ?$

A) $\begin{bmatrix} -2 & -8 & -10 \\ 2 & 3 & 6 \end{bmatrix}$ B) $\begin{bmatrix} -2 & 4 & 5 \\ -4 & 3 & 6 \end{bmatrix}$

C) $\begin{bmatrix} -2 & 4 & -10 \\ 2 & -6 & 6 \end{bmatrix}$ D) $\begin{bmatrix} -2 & -8 & -10 \\ -4 & -6 & -12 \end{bmatrix}$

E) $\begin{bmatrix} 1 & -8 & 5 \\ 2 & -6 & 6 \end{bmatrix}$

3. $A = \begin{bmatrix} 0 & 2 \\ 1 & 3 \end{bmatrix}_{2x2}$ $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}_{2x2}$

$\Rightarrow 2A - 4B = ?$

A) $\begin{bmatrix} -4 & 2 \\ 4 & 4 \end{bmatrix}$ B) $\begin{bmatrix} -4 & -4 \\ 1 & 4 \end{bmatrix}$ C) $\begin{bmatrix} -4 & 4 \\ 4 & 2 \end{bmatrix}$

D) $\begin{bmatrix} -4 & 4 \\ 2 & 2 \end{bmatrix}$ E) $\begin{bmatrix} 4 & -4 \\ 2 & 2 \end{bmatrix}$

4. $A = \begin{bmatrix} -1 & 3 & 4 \\ 1 & 2 & -2 \end{bmatrix}_{2x3}$ $B = \begin{bmatrix} 3 & 0 & 2 \\ 1 & -4 & 5 \end{bmatrix}_{2x3}$

$\Rightarrow 3A + 2B = ?$

A) $\begin{bmatrix} 3 & 9 & 16 \\ 5 & -2 & 4 \end{bmatrix}$ B) $\begin{bmatrix} 3 & 9 & 16 \\ 2 & -2 & 3 \end{bmatrix}$

C) $\begin{bmatrix} 2 & 3 & 6 \\ 5 & -2 & 4 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 3 & 6 \\ 2 & -2 & 3 \end{bmatrix}$

E) $\begin{bmatrix} 2 & -2 & 3 \\ 2 & 3 & 6 \end{bmatrix}$

5. $A = \begin{bmatrix} -1 & 2 \\ 1 & -2 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 0 \\ -4 & -2 \end{bmatrix}$

$C = 2A - B$ $\Rightarrow c_{12} + c_{21} = ?$

A) -7 B) -1 C) 1 D) 2 E) 10

6. $A = \begin{bmatrix} 0 & 1 & 0 \\ 4 & -1 & 2 \\ 0 & 3 & -4 \end{bmatrix}$ $B = \begin{bmatrix} -4 & 2 & 0 \\ 1 & 4 & 2 \\ 5 & -3 & 1 \end{bmatrix}$

$C = 2A + 2B$ $\Rightarrow c_{23} + c_{33} = ?$

A) -2 B) 0 C) 2 D) 3 E) 4

7. $A = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 2 \\ 3 & 1 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 0 \\ 4 & 3 \end{bmatrix}$

$D = 3A + 2B - C$

$\Rightarrow d_{21} - d_{22} = ?$

A) -5 B) 0 C) 5 D) 10 E) 13

8. I birim matris *(I identity matrix)*

$\Rightarrow 3I - I = ?$

A) $\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$ B) $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ C) $\begin{bmatrix} 2 & 2 \\ 0 & 0 \end{bmatrix}$ D) $\begin{bmatrix} 0 & 0 \\ 2 & 2 \end{bmatrix}$ E) $\begin{bmatrix} 0 & 2 \\ 2 & 0 \end{bmatrix}$

9. I birim matris *(I identity matrix)*

$2 \cdot \begin{bmatrix} 2 & 5 \\ 3 & 4 \end{bmatrix} - I = ?$

A) $\begin{bmatrix} 3 & 9 \\ 5 & 7 \end{bmatrix}$ B) $\begin{bmatrix} 4 & 9 \\ 5 & 8 \end{bmatrix}$ C) $\begin{bmatrix} 2 & 5 \\ 6 & 8 \end{bmatrix}$ D) $\begin{bmatrix} 4 & 10 \\ 3 & 4 \end{bmatrix}$ E) $\begin{bmatrix} 3 & 10 \\ 6 & 7 \end{bmatrix}$

10. $\begin{bmatrix} 0 & -4 \\ 4 & 8 \end{bmatrix} - 2 \cdot \begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix} + 3I = ?$

A) $\begin{bmatrix} 5 & -4 \\ -9 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 5 & -4 \\ 9 & 0 \end{bmatrix}$ C) $\begin{bmatrix} 5 & -4 \\ 0 & -9 \end{bmatrix}$ D) $\begin{bmatrix} 5 & -4 \\ 0 & 9 \end{bmatrix}$ E) $\begin{bmatrix} 4 & 5 \\ 9 & 0 \end{bmatrix}$

11. $A - B = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$ $A + B = \begin{bmatrix} 3 & -2 \\ 5 & -4 \end{bmatrix}$

$\Rightarrow B = ?$

A) $\begin{bmatrix} 2 & -1 \\ 2 & -1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & -1 \\ 3 & -3 \end{bmatrix}$ C) $\begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ D) $\begin{bmatrix} 2 & -1 \\ 1 & -1 \end{bmatrix}$ E) $\begin{bmatrix} 2 & -1 \\ -3 & 3 \end{bmatrix}$

12. $2A - B = \begin{bmatrix} 4 & 2 \\ -3 & 4 \end{bmatrix}$ $A + 4B = \begin{bmatrix} 2 & 7 \\ -9 & -1 \end{bmatrix}$

$\Rightarrow A + B = ?$

A) $\begin{bmatrix} 6 & 9 \\ -12 & 3 \end{bmatrix}$ B) $\begin{bmatrix} 6 & 9 \\ -4 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 3 & 2 \\ -4 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 3 \\ -4 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 2 & 3 \\ -12 & 3 \end{bmatrix}$

13. $3 \cdot \begin{bmatrix} x \\ y \end{bmatrix} + 4 \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -14 \\ 21 \end{bmatrix}$

$\Rightarrow x \cdot y = ?$

A) -6 B) -3 C) -2 D) 2 E) 3

14. $3 \cdot \begin{bmatrix} a \\ b \end{bmatrix} - 4 \cdot \begin{bmatrix} b \\ a \end{bmatrix} = \begin{bmatrix} 7 \\ -7 \end{bmatrix}$

$\Rightarrow a = ?$

A) -1 B) 0 C) 1 D) 2 E) 4

15. $x, y \in R$

$x \cdot \begin{bmatrix} -1 & 0 \\ 2 & 1 \end{bmatrix} + y \cdot \begin{bmatrix} -1 & 2 \\ 4 & -3 \end{bmatrix} = \begin{bmatrix} 14 & -8 \\ -36 & 2 \end{bmatrix}$

$\Rightarrow x + y = ?$

A) -14 B) -9 C) -8 D) -7 E) -2

16. $a, b \in R$

$(a-1) \cdot \begin{bmatrix} 4 & 0 \\ 3 & -3 \end{bmatrix} + (b+1) \cdot \begin{bmatrix} -1 & 3 \\ 4 & 0 \end{bmatrix} = \begin{bmatrix} 6 & 6 \\ 14 & -6 \end{bmatrix}$

$\Rightarrow a \cdot b = ?$

A) -3 B) 3 C) 4 D) 6 E) 12

1. $A = \begin{bmatrix} 0 & 1 \\ 3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$\Rightarrow A \cdot B = ?$

A) $\begin{bmatrix} -2 \\ -1 \end{bmatrix}$ B) $\begin{bmatrix} -1 \\ -2 \end{bmatrix}$ C) $\begin{bmatrix} 2 \\ -1 \end{bmatrix}$ D) $\begin{bmatrix} -2 \\ 1 \end{bmatrix}$ E) $\begin{bmatrix} -1 \\ 2 \end{bmatrix}$

2. $\begin{bmatrix} 1 & 2 & 0 \\ 3 & 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 1 & 1 \\ 2 & 0 \end{bmatrix} = ?$

A) $\begin{bmatrix} 3 & 4 & 1 \\ 8 & 7 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 8 & 7 & 0 \\ 3 & 4 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 3 & 4 \\ 8 & 7 \end{bmatrix}$ D) $\begin{bmatrix} 8 & 7 \\ 4 & 3 \end{bmatrix}$ E) $\begin{bmatrix} 3 & 4 \\ 1 & 0 \\ 8 & 7 \end{bmatrix}$

3. $\begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}^2 = ?$

A) $\begin{bmatrix} 0 & 1 \\ 2 & 2 \end{bmatrix}$ B) $\begin{bmatrix} 2 & 0 \\ 2 & 2 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ D) $\begin{bmatrix} 3 & 1 \\ 2 & 2 \end{bmatrix}$ E) $\begin{bmatrix} 3 & 1 \\ 1 & 0 \end{bmatrix}$

4. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}^2 = ?$

A) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

5. $\begin{bmatrix} 0 & 1 & 2 \\ 2 & -1 & 0 \\ 4 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 4 & 2 \\ 3 & 5 \\ 2 & 3 \end{bmatrix} = ?$

A) $\begin{bmatrix} 11 & 7 \\ -9 & -11 \\ 16 & 21 \end{bmatrix}$ B) $\begin{bmatrix} 7 & 11 \\ -11 & -9 \\ 21 & 16 \end{bmatrix}$ C) $\begin{bmatrix} 7 & 11 \\ 5 & -1 \\ 21 & 16 \end{bmatrix}$ D) $\begin{bmatrix} 7 & 11 \\ 21 & -9 \\ -11 & 16 \end{bmatrix}$ E) $\begin{bmatrix} 7 & 11 \\ -9 & -11 \\ 16 & 21 \end{bmatrix}$

6. $\begin{bmatrix} 1 & 0 & 3 \\ 2 & -1 & -2 \\ -3 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 2 & 1 & 2 \\ -2 & 0 & 3 \\ 0 & 1 & -1 \end{bmatrix} = \begin{bmatrix} a & \cdot & \cdot \\ \cdot & b & \cdot \\ \cdot & \cdot & c \end{bmatrix}$

$\Rightarrow a + b + c = ?$

A) -2 B) -1 C) 1 D) 2 E) 3

7. $[x \ 0 \ 1 \ 3x] \cdot \begin{bmatrix} 1 \\ 0 \\ 3 \\ 2 \end{bmatrix} = [10]$

$\Rightarrow x = ?$

A) -7 B) -1 C) 0 D) 1 E) 7

8. $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix} \cdot \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 4 \\ 10 \end{bmatrix}$

$\Rightarrow a \cdot b = ?$

A) 4 B) 8 C) 10 D) 20 E) 40

9. $A = \begin{bmatrix} 1 & 0 & 1 \\ -1 & 2 & 3 \\ 1 & -1 & -3 \end{bmatrix}$ $B = \begin{bmatrix} 4 \\ 3 \\ 4 \end{bmatrix}$ $X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$

$A \cdot X = B \quad \Rightarrow x_1 + x_2 + x_3 = ?$

A) 11 B) 10 C) 6 D) 4 E) 2

10. $A = \begin{bmatrix} 0 & 1 \\ 3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$ $X = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

$A \cdot X = B + X \quad \Rightarrow x_1 + x_2 = ?$

A) –2 B) 0 C) 2 D) 3 E) 4

11. $\begin{bmatrix} a & 1 \\ -b & 2 \end{bmatrix}^2 = \begin{bmatrix} -3 & 1 \\ -4 & 0 \end{bmatrix}$

$\Rightarrow a + b = ?$

A) –3 B) –2 C) 0 D) 2 E) 3

12. $\begin{bmatrix} a & -1 \\ 1 & -a \end{bmatrix}^2 = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$

$\Rightarrow a^2 = ?$

A) 0 B) 1 C) 4 D) 9 E) 16

13. $A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$ $f(x) = x^2 - 2x$

$\Rightarrow f(A) = ?$

A) $\begin{bmatrix} -1 & -2 \\ 0 & 3 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 2 & 2 \\ 0 & -2 \end{bmatrix}$

D) $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ E) $\begin{bmatrix} -1 & 2 \\ 0 & -3 \end{bmatrix}$

14. $A = \begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix}$ $f(x) = x^2 - 4x + 4$

$\Rightarrow f(A) = ?$

A) $\begin{bmatrix} -2 & 9 \\ -3 & 1 \end{bmatrix}$ B) $\begin{bmatrix} -4 & 9 \\ -3 & -1 \end{bmatrix}$ C) $\begin{bmatrix} -4 & 7 \\ -5 & -1 \end{bmatrix}$

D) $\begin{bmatrix} 9 & -2 \\ 1 & -3 \end{bmatrix}$ E) $\begin{bmatrix} -2 & -3 \\ 1 & -3 \end{bmatrix}$

15. $A = \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix}$ $f(x) = x^2 + 5x + 6$

$\Rightarrow f(A) = ?$

A) $\begin{bmatrix} 4 & 0 \\ -2 & 4 \end{bmatrix}$ B) $\begin{bmatrix} 10 & 5 \\ 0 & -10 \end{bmatrix}$ C) $\begin{bmatrix} 8 & 1 \\ 0 & 4 \end{bmatrix}$

D) $\begin{bmatrix} 20 & 5 \\ 0 & 0 \end{bmatrix}$ E) $\begin{bmatrix} 22 & 6 \\ -2 & -6 \end{bmatrix}$

16. $A = [a_{ij}]_{(n+1) \times 3}$ $B = [b_{ij}]_{(m-3) \times (p-3)}$

$C = [c_{ij}]_{5 \times 3}$ $A \cdot B = C$

$\Rightarrow m \cdot n - p = ?$

A) 4 B) 6 C) 10 D) 18 E) 36

1. $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \Rightarrow A^4 = ?$

A) $\begin{bmatrix} 4 & 4 \\ 4 & 4 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 32 & 32 \\ 32 & 32 \end{bmatrix}$ D) $\begin{bmatrix} 16 & 16 \\ 16 & 16 \end{bmatrix}$ E) $\begin{bmatrix} 8 & 8 \\ 8 & 8 \end{bmatrix}$

2. $A = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix} \Rightarrow A^7 = ?$

A) $\begin{bmatrix} 7 & 0 \\ 14 & 7 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0 \\ 14 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 0 \\ 8 & 7 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 1 \\ 7 & 0 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 0 \\ 7 & 1 \end{bmatrix}$

3. $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} \Rightarrow A^4 = ?$

A) $\begin{bmatrix} 4 & 0 \\ 0 & 8 \end{bmatrix}$ B) $\begin{bmatrix} 4 & 1 \\ 1 & 8 \end{bmatrix}$ C) $\begin{bmatrix} 8 & 1 \\ 1 & 16 \end{bmatrix}$ D) $\begin{bmatrix} 4 & 1 \\ 0 & 8 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 0 \\ 0 & 16 \end{bmatrix}$

4. $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ $i^2 = -1$ $\Rightarrow A^6 = ?$

A) $\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ B) $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$ C) $\begin{bmatrix} -i & 0 \\ 0 & -i \end{bmatrix}$ D) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ E) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$

5. $A = \begin{bmatrix} 1 & 4 \\ 0 & 1 \end{bmatrix} \Rightarrow A^{25} = ?$

A) $4^{25}\begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 4 \\ 1 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 4^{25} \\ 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 100 \\ 0 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 0 \\ 100 & 1 \end{bmatrix}$

6. $A = \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix} \Rightarrow A^{50} = ?$

A) $\begin{bmatrix} 1 & 0 \\ -100 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & -100 \\ 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 0 \\ 2^{50} & 1 \end{bmatrix}$ D) $2^{50}\begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 2^{50} \\ 0 & 1 \end{bmatrix}$

7. $A = \begin{bmatrix} 1 & 3 \\ 0 & -1 \end{bmatrix} \Rightarrow A^{20} = ?$

A) $\begin{bmatrix} 1 & 3 \\ 0 & -1 \end{bmatrix}$ B) $\begin{bmatrix} -1 & 3 \\ 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

8. $A = \begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix} \Rightarrow A^6 = ?$

A) $\begin{bmatrix} 5^6 & 0 \\ 0 & 2^6 \end{bmatrix}$ B) $\begin{bmatrix} 12 & 0 \\ 0 & 30 \end{bmatrix}$ C) $\begin{bmatrix} 2^6 & 0 \\ 0 & 3^6 \end{bmatrix}$ D) $10^6\begin{bmatrix} 5 & 0 \\ 0 & 2 \end{bmatrix}$ E) $\begin{bmatrix} 2^6 & 0 \\ 0 & 5^6 \end{bmatrix}$

9. $A = \begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix} \Rightarrow A^{30} = ?$

A) $\begin{bmatrix} 2^{30} & 0 \\ 0 & 3^{30} \end{bmatrix}$ B) $\begin{bmatrix} 3^{40} & 0 \\ 0 & 2^{40} \end{bmatrix}$ C) $\begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix}$

D) $3^{30}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 3^{30} & 0 \\ 0 & 2^{30} \end{bmatrix}$

10. $A = \begin{bmatrix} 3 & 2 \\ 0 & -3 \end{bmatrix} \Rightarrow A^{40} = ?$

A) $3^{20}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ B) $2^{20}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

C) $2^{40}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ D) $9^{40}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

E) $9^{20}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

11. $A = \begin{bmatrix} 2 & 0 \\ 3 & -2 \end{bmatrix} \Rightarrow A^{51} = ?$

A) $4^{25}\begin{bmatrix} 2 & 0 \\ 3 & -2 \end{bmatrix}$ B) $4^{50}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

C) $4^{25}\begin{bmatrix} 2 & 3 \\ 0 & -2 \end{bmatrix}$ D) $2^{25}\begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$

E) $4^{25}\begin{bmatrix} -2 & 0 \\ 1 & 2 \end{bmatrix}$

12. $A = \begin{bmatrix} -1 & 1 \\ 2 & 1 \end{bmatrix} \Rightarrow A^{1986} = ?$

A) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ B) $3 \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ C) $3^{993} \cdot A$

D) $3^{998} \cdot A$ E) $3^{993}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

13. I birim matris *I identity matrix*

$\begin{bmatrix} 3 & 4 \\ 0 & -3 \end{bmatrix}^{40} = ?$

A) $\begin{bmatrix} 3^{40} & 4 \\ 0 & 3^{40} \end{bmatrix}$ B) $\begin{bmatrix} 120 & 2 \\ 0 & -120 \end{bmatrix}$ C) $3^{40} \cdot I$

D) $3^{20} \cdot I$ E) $3^{30} \cdot I$

14. $A = \begin{bmatrix} -2 & -2 \\ 3 & 3 \end{bmatrix} \Rightarrow A^{42} = ?$

A) $\begin{bmatrix} 2 & 2 \\ -3 & -3 \end{bmatrix}$ B) $\begin{bmatrix} -2 & 2 \\ 3 & -3 \end{bmatrix}$ C) $\begin{bmatrix} 2 & -2 \\ 3 & -3 \end{bmatrix}$

D) $\begin{bmatrix} 2 & -2 \\ -3 & 3 \end{bmatrix}$ E) $\begin{bmatrix} -2 & -2 \\ 3 & 3 \end{bmatrix}$

15. $n \in N^+$

$A = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$ $A^{2n+10} = \begin{bmatrix} 1 & 180 \\ 0 & 1 \end{bmatrix} \Rightarrow n = ?$

A) 25 B) 20 C) 16 D) 12 E) 10

16. $n \in Z^+$

$A = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ $A^{4n^3} = \begin{bmatrix} 1 & 0 \\ 512 & 1 \end{bmatrix} \Rightarrow n = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

1. $A = \begin{bmatrix} 0 & 1 \\ 3 & 5 \end{bmatrix}$ $\Rightarrow A^T = ?$

A) $\begin{bmatrix} 1 & 0 \\ 5 & 3 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 3 \\ 1 & 5 \end{bmatrix}$ C) $\begin{bmatrix} 3 & 5 \\ 0 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 3 & 0 \\ 5 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 3 \\ 0 & 5 \end{bmatrix}$

2. $A = \begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 0 \\ 2 & 4 & 1 \end{bmatrix}$ $\Rightarrow A^T = ?$

A) $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & -1 \\ -2 & 1 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 2 & 4 & 1 \\ 3 & -1 & 0 \\ 1 & 0 & -2 \end{bmatrix}$ C) $\begin{bmatrix} 2 & 3 & 1 \\ 4 & -1 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ D) $\begin{bmatrix} -2 & 0 & 1 \\ 0 & -1 & 3 \\ 1 & 4 & 2 \end{bmatrix}$ E) $\begin{bmatrix} 1 & 3 & 2 \\ 0 & -1 & 4 \\ -2 & 0 & 1 \end{bmatrix}$

3. $A = \begin{bmatrix} 1 & 5 & -7 \\ -1 & 4 & 6 \\ 0 & -2 & 3 \end{bmatrix}$ $B = A^T$ $[a_{ji}] = [b_{ij}]$

$\Rightarrow b_{12} + b_{23} = ?$

A) -3 B) -2 C) -1 D) 0 E) 1

4. $A = \begin{bmatrix} a+2 & b-3 \\ 4 & 1 \end{bmatrix}$ $A = A^T$

$\Rightarrow b = ?$

A) 1 B) 2 C) 3 D) 4 E) 7

5. $A = \begin{bmatrix} 3 & a \\ 4-b & 2 \end{bmatrix}$ $A = A^T$

$\Rightarrow a + b = ?$

A) 2 B) 3 C) 4 D) 6 E) 7

6. $A = \begin{bmatrix} a-1 & -1 \\ 3 & b \end{bmatrix}$ $B = \begin{bmatrix} 4 & 3 \\ -1 & a-1 \end{bmatrix}$

$B = A^T$ $\Rightarrow a \cdot b = ?$

A) -4 B) -3 C) -1 D) 12 E) 20

7. $A = \begin{bmatrix} 3 & 2a+b \\ a+b+4 & a \end{bmatrix}$

$A = A^T$ $\Rightarrow a = ?$

A) 0 B) 2 C) 3 D) 4 E) 6

8. $A = \begin{bmatrix} 2 & 3 \\ 2 & 1 \end{bmatrix}$ $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$

$\Rightarrow A^T \cdot B^T = ?$

A) $\begin{bmatrix} -2 & 6 \\ -3 & 5 \end{bmatrix}$ B) $\begin{bmatrix} 2 & 6 \\ 3 & 5 \end{bmatrix}$ C) $\begin{bmatrix} -2 & -3 \\ 6 & 5 \end{bmatrix}$ D) $\begin{bmatrix} 6 & 5 \\ 2 & 3 \end{bmatrix}$ E) $\begin{bmatrix} 5 & -2 \\ -3 & 6 \end{bmatrix}$

9. $A = \begin{bmatrix} 1 & 2 \\ -1 & 0 \\ 2 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 1 & -2 \\ 2 & 1 & -1 \end{bmatrix}$

$\Rightarrow A^T \cdot B^T = ?$

A) $\begin{bmatrix} 0 & -2 \\ 1 & 1 \end{bmatrix}$ B) $\begin{bmatrix} -2 & -1 \\ 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$

D) $\begin{bmatrix} -2 & -1 & 1 \\ 0 & 1 & 2 \end{bmatrix}$ E) $\begin{bmatrix} -2 & 0 \\ -1 & 1 \\ 1 & 2 \end{bmatrix}$

10. $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$

$\Rightarrow 2B^T - 3A^T - I = ?$

A) $\begin{bmatrix} 4 & 8 \\ 6 & 2 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 3 \\ 3 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 3 & 5 \\ 3 & 1 \end{bmatrix}$

D) $\begin{bmatrix} -1 & 3 \\ 3 & -1 \end{bmatrix}$ E) $\begin{bmatrix} 3 & 3 \\ 5 & 1 \end{bmatrix}$

11. $A = \begin{bmatrix} 0 & a \\ 3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 9 & 6 \\ 6 & 13 \end{bmatrix}$

$A \cdot A^T = B$ $\Rightarrow a = ?$

A) 2 B) 3 C) 6 D) 9 E) 13

12. $A = \begin{bmatrix} -2 & b \\ a & 2 \end{bmatrix}$ $B = \begin{bmatrix} 29 & -14 \\ -14 & 8 \end{bmatrix}$

$A \cdot A^T = B$ $\Rightarrow (a, b) = ?$

A) (– 4, 10) B) (– 2, 5) C) (– 2, – 5)

D) (2, 5) E) (2, – 5)

13. $A = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}$ $f(x) = x^2 + x$

$\Rightarrow f(A^T) = ?$

A) $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ B) $\begin{bmatrix} 11 & -6 \\ 6 & 5 \end{bmatrix}$ C) $\begin{bmatrix} 8 & -5 \\ 5 & 3 \end{bmatrix}$

D) $\begin{bmatrix} -2 & 0 \\ -1 & 1 \end{bmatrix}$ E) $\begin{bmatrix} 11 & 6 \\ -6 & 5 \end{bmatrix}$

14. $A = \begin{bmatrix} 0 & 1 \\ 3 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 1 \\ 4 & 5 \end{bmatrix}$

$A \cdot B^T = C^T$ $\Rightarrow c_{12} = ?$

A) 1 B) 5 C) 10 D) 12 E) 32

15. $A = \begin{bmatrix} -1 & 2 \\ 1 & 0 \end{bmatrix}$ $A \cdot B = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$

$\Rightarrow B \cdot B^T = ?$

A) $[13]$ B) $[8]$ C) $[2]$

D) $[3 \;\; 2]$ E) $\begin{bmatrix} 4 & 4 \\ 4 & 4 \end{bmatrix}$

16. $B = [b_{ij}]_{nxn}$ $A = B + B^T$ $\Rightarrow A^T = ?$

A) A^T B) B^{-1} C) A^{-1} D) A E) B^T

1. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

$\Rightarrow \det(A) = ?$

A) –2 B) –1 C) 1 D) 2 E) 6

2. $\begin{vmatrix} 17 & 16 \\ 18 & 15 \end{vmatrix} = ?$

A) 33 B) 32 C) 15 D) – 34 E) – 33

3. $\begin{vmatrix} 10 & 12 \\ 8 & 11 \end{vmatrix} = ?$

A) 110 B) 14 C) – 8 D) – 80 E) – 96

4. $\begin{vmatrix} 1986 & 1988 \\ 1982 & 1985 \end{vmatrix} = ?$

A) 1986 B) 1988 C) 1994 D) 1996 E) 2000

5. $\begin{vmatrix} x-1 & x+3 \\ x & x+2 \end{vmatrix} = 4$

$\Rightarrow x = ?$

A) – 3 B) – 2 C) – 1 D) 0 E) 1

6. $\begin{vmatrix} 4x & 2x^2 \\ -2 & (x-2) \end{vmatrix} = 16$

$\Rightarrow x = ?$

A) – 4 B) – 2 C) 0 D) 2 E) 4

7. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

$\Rightarrow M_{21} = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

8. $A = \begin{bmatrix} 2 & 3 & 1 \\ 4 & 0 & 2 \\ -1 & 5 & 6 \end{bmatrix}$

$\Rightarrow M_{33} = ?$

A) –12 B) –10 C) 6 D) 12 E) 15

9. $A = \begin{bmatrix} 4 & 2 \\ -1 & 6 \end{bmatrix}$

$\Rightarrow A_{12} = ?$

A) -4 B) -2 C) -1 D) 1 E) 2

10. $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 2 & -1 \\ 1 & 4 & 5 \end{bmatrix}$

$\Rightarrow A_{32} = ?$

A) -2 B) 2 C) 4 D) 6 E) 10

11. $A = \begin{bmatrix} 2 & 1 & 2 \\ 0 & -1 & 3 \\ 3 & 4 & 0 \end{bmatrix}$

$\Rightarrow A_{13} = ?$

A) -3 B) -2 C) 0 D) 2 E) 3

12. $\begin{vmatrix} 1 & 3 & -2 \\ 0 & 4 & 1 \\ -1 & 2 & 0 \end{vmatrix} = ?$

A) -13 B) -8 C) -3 D) -2 E) 3

13. $\begin{vmatrix} 2 & 3 & -1 \\ 4 & 1 & 2 \\ 1 & x & 4 \end{vmatrix} = -17$

$\Rightarrow x = ?$

A) -3 B) -2 C) -1 D) 1 E) 2

14. $\begin{vmatrix} 1 & a & 2 \\ -a & 3 & 5 \\ 4 & -2 & a \end{vmatrix} = a^3 - 5$

$\Rightarrow a = ?$

A) 3 B) 2 C) 1 D) $\frac{1}{3}$ E) $\frac{1}{2}$

15. $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 4 & 2 \\ 0 & 1 & 2 \end{bmatrix}$

$\Rightarrow a_{11}A_{11} + a_{12}A_{12} + a_{13}A_{13} = ?$

A) 17 B) 13 C) 10 D) 6 E) 2

16. $A = \begin{bmatrix} -2 & 0 & 0 \\ 3 & 1 & 4 \\ 1 & 2 & -1 \end{bmatrix}$

$\Rightarrow a_{13}A_{13} + a_{23}A_{23} + a_{33}A_{33} = ?$

A) 18 B) 16 C) 14 D) 12 E) 10

1. $\begin{vmatrix} 3 & 1 & -2 \\ 0 & 0 & 0 \\ -1 & 4 & 2 \end{vmatrix} = ?$

A) 0 B) 1 C) 2 D) 3 E) 4

2. $\begin{vmatrix} 3 & 5 & 0 \\ -6 & 4 & 0 \\ 7 & -1 & 0 \end{vmatrix} = ?$

A) – 6 B) –1 C) 0 D) 14 E) 20

3. $\begin{vmatrix} 1 & 3 & -2 \\ 2 & 2 & -4 \\ 0 & 5 & 0 \end{vmatrix} = ?$

A) –1 B) 0 C) 2 D) 4 E) 5

4. $\begin{vmatrix} -3 & -3 & 5 \\ 2 & 2 & 7 \\ 4 & 4 & 8 \end{vmatrix} = ?$

A) – 6 B) – 3 C) – 2 D) 0 E) 7

5. $\begin{vmatrix} 3 & 1 & 4 \\ -2 & 0 & 3 \\ 3 & 1 & 4 \end{vmatrix} = ?$

A) 0 B) 1 C) 2 D) 3 E) 6

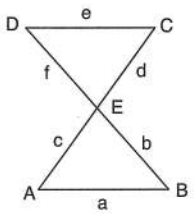
6. $\begin{vmatrix} 3 & 4 & -2 \\ -6 & -8 & 4 \\ 0 & 3 & 5 \end{vmatrix} = ?$

A) – 2 B) – 1 C) 0 D) 1 E) 2

7. $\begin{vmatrix} 0 & -1 & 2 \\ 4 & 7 & 5 \\ 0 & 3 & 6 \end{vmatrix} = ?$

A) 48 B) 24 C) 0 D) – 24 E) – 48

8.



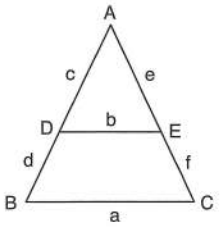
[AB] // [DC]

[AC] ∩ [BD] = {E}

$\begin{vmatrix} a & b & c \\ e & f & d \\ c & b & a \end{vmatrix} = ?$

A) 12 B) 8 C) 0 D) – 6 E) – 8

9.



[DE] // [BC]

$$\Rightarrow \begin{vmatrix} 3 & -4 & 7 \\ b & c & e \\ a & c+d & f+e \end{vmatrix} = ?$$

A) $a \cdot d$ B) $c \cdot e$ C) 0 D) $a \cdot b$ E) $d \cdot f$

10. $\begin{vmatrix} a & 2 \\ 1 & b \end{vmatrix} = 5$

$$\Rightarrow \begin{vmatrix} 3a & 6 \\ 3 & 3b \end{vmatrix} = ?$$

A) 5 B) 15 C) 25 D) 35 E) 45

11. $\begin{vmatrix} 3x & -1 & 3 \\ 2 & x & 6 \\ -4 & 0 & 7 \end{vmatrix} = 32$

$$\Rightarrow \begin{vmatrix} 3x & 2 & -4 \\ -1 & x & 0 \\ 3 & 6 & 7 \end{vmatrix} = ?$$

A) –32 B) –12 C) 6 D) 32 E) 64

12. $\begin{vmatrix} 1 & -1 \\ 2 & 4 \end{vmatrix} = k$

$$\Rightarrow \begin{vmatrix} 2 & 4 \\ 1 & -1 \end{vmatrix} = ?$$

A) – 2k B) – k C) 0 D) k E) 2k

13. $\begin{vmatrix} e & y & c \\ x & b & d \\ a & f & z \end{vmatrix} = 5$

$$\Rightarrow \begin{vmatrix} x & b & d \\ e & y & c \\ a & f & z \end{vmatrix} = ?$$

A) – 10 B) – 5 C) 0 D) 5 E) 10

14. $\begin{vmatrix} x & 4 & 1 \\ y & -2 & 0 \\ z & 3 & 2 \end{vmatrix} = 3$

$$\Rightarrow \begin{vmatrix} 1 & 4 & x \\ 0 & -2 & y \\ 2 & 3 & z \end{vmatrix} = ?$$

A) 6 B) 3 C) – 3 D) – 6 E) – 9

15. $\begin{vmatrix} a & b & c \\ d & e & f \\ m & n & p \end{vmatrix} = k$

$$\Rightarrow \begin{vmatrix} d & e & f \\ m & n & p \\ a & b & c \end{vmatrix} = ?$$

A) k^2 B) 3k C) k D) – k E) – 2k

16. $\begin{vmatrix} 3 & x \\ y & 2 \end{vmatrix} = t$

$$\Rightarrow \begin{vmatrix} 3 & 6+x \\ y & 2y+2 \end{vmatrix} = ?$$

A) t B) 2t C) t^2 D) – t E) – 2t

1. $\begin{vmatrix} 2 & -1 & 3 \\ 5 & 0 & 2 \\ -3 & -2 & 1 \end{vmatrix} = ?$

A) – 35 B) – 11 C) – 5 D) 0 E) 35

2. $\begin{vmatrix} 0 & 0 & 2 \\ 0 & 3 & -1 \\ 2 & -4 & 7 \end{vmatrix} = ?$

A) 12 B) 3 C) 0 D) –12 E) – 24

3. $A = [a_{ij}]_{2x2}$
$\det(A) = 8$
$\Rightarrow \det(2A) = ?$

A) 0 B) 8 C) 16 D) 32 E) 64

4. $A = [a_{ij}]_{3x3}$
$\det(A) = 3$
$\Rightarrow 2\det(A) + \det(3A) = ?$

A) 5 B) 6 C) 12 D) 81 E) 87

5. $\begin{vmatrix} 7 & 2 & 0 \\ 0 & 1 & 3 \\ -1 & 4 & 6 \end{vmatrix} = ?$

A) – 60 B) – 48 C) – 24 D) 36 E) 48

6. $\begin{vmatrix} 3 & 3 & 3 \\ a+b & a+c & b+c \\ c & b & a \end{vmatrix} = ?$

A) a(a + c) B) 2(b + c) C) 8(a + c) D) 2a(c + b) E) 0

7. $A = \begin{bmatrix} 3 & -1 & 1 \\ 2 & 2 & 0 \\ 4 & 0 & 0 \end{bmatrix}$

$B = \begin{bmatrix} 4 & 3 & -1 \\ 0 & 2 & -1 \\ 0 & 0 & 2 \end{bmatrix}$

$\Rightarrow \det(A \cdot B) = ?$

A) 480 B) 128 C) 0 D) –128 E) – 480

8. $\begin{vmatrix} 2 & 3 & -7 \\ 4 & 5 & 9 \\ -1 & 8 & 6 \end{vmatrix} + \begin{vmatrix} 2 & 3 & -7 \\ 4 & 5 & 9 \\ 1 & -8 & -6 \end{vmatrix} = ?$

A) – 1 B) 0 C) 1 D) 2 E) 3

9. $A = \begin{bmatrix} 4 & 5 \\ 2 & -3 \end{bmatrix}$

$\Rightarrow Ek(A) = ?$

A) $\begin{bmatrix} 5 & 4 \\ -3 & 2 \end{bmatrix}$ B) $\begin{bmatrix} -3 & -5 \\ -2 & 4 \end{bmatrix}$ C) $\begin{bmatrix} 3 & 5 \\ 2 & -4 \end{bmatrix}$ D) $\begin{bmatrix} 4 & 5 \\ 2 & -3 \end{bmatrix}$ E) $\begin{bmatrix} -3 & 5 \\ 2 & 4 \end{bmatrix}$

10. $A = \begin{bmatrix} a & -1 \\ 1 & a \end{bmatrix}$ $\det(A) = 10$

$\Rightarrow \prod a = ?$

A) 9 B) 6 C) 3 D) – 3 E) – 9

11. $A = \begin{bmatrix} a & b & c \\ 1 & -2 & 3 \\ 4 & 3 & 2 \end{bmatrix}$ $\frac{a}{4} = \frac{b}{3} = \frac{c}{2}$

$\Rightarrow \det(A) = ?$

A) – 2 B) – 1 C) 0 D) 1 E) 2

12. $A = \begin{bmatrix} 2014 & 2015 \\ 2013 & 2014 \end{bmatrix}$

$\Rightarrow \det(A^{2015}) = ?$

A) – 2 B) –1 C) 0 D) 1 E) 2

13. $\begin{vmatrix} 1 & x & y \\ 3 & y & x \\ x & y & 2 \end{vmatrix} = 7$

$\Rightarrow \begin{vmatrix} x & y & 1 \\ y & x & 3 \\ y & 2 & x \end{vmatrix} = ?$

A) – 7 B) – 4 C) 0 D) 4 E) 7

14. $\begin{vmatrix} 3 & b & a \\ b & 2 & b \\ a & a & 1 \end{vmatrix} = k$

$\Rightarrow \begin{vmatrix} 3 & b & a \\ b+6 & 2b+2 & 2a+b \\ a+3 & a+b & a+1 \end{vmatrix} = ?$

A) 2k B) $k^2 - k$ C) – k D) k E) $2k - \frac{1}{2}k$

15. $\begin{vmatrix} x & 2 & y \\ y & 1 & z \\ z & 4 & x \end{vmatrix} = k$

$\Rightarrow \begin{vmatrix} x+2 & x & 2x+y \\ y+1 & y & 2y+z \\ z+4 & z & 2z+x \end{vmatrix} = ?$

A) 2k B) k C) 2k + 1 D) $\frac{k}{2}$ E) – k

16. $\begin{vmatrix} a & b & c \\ 0 & x & z \\ 1 & a & x \end{vmatrix} = k$

$\Rightarrow \begin{vmatrix} a+b & b & b+c \\ 3x & 3x & 3x+3z \\ \frac{a+1}{2} & \frac{a}{2} & \frac{a+x}{2} \end{vmatrix} = ?$

A) $\frac{9}{4}k$ B) $-\frac{2}{3}k$ C) $\frac{3}{2}k$ D) $-\frac{3}{2}k$ E) $\frac{3}{4}k$

1. $A = \begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix} \Rightarrow A^{-1} = ?$

A) $\begin{bmatrix} -4 & 3 \\ 3 & -2 \end{bmatrix}$ B) $\begin{bmatrix} 3 & -2 \\ -4 & 3 \end{bmatrix}$ C) $\begin{bmatrix} 1 & -3 \\ -2 & 1 \end{bmatrix}$ D) $\begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$ E) $\begin{bmatrix} -2 & 3 \\ 3 & -4 \end{bmatrix}$

2. $A = \begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix} \Rightarrow A^{-1} = ?$

A) $\begin{bmatrix} 4 & 1 \\ 7 & 2 \end{bmatrix}$ B) $\begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix}$ C) $\begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix}$ D) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{4} \\ -\frac{7}{2} & 1 \end{bmatrix}$ E) $\begin{bmatrix} 1 & -\frac{1}{2} \\ -\frac{7}{2} & 2 \end{bmatrix}$

3. $A = \begin{bmatrix} 11 & 5 \\ 2 & 1 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

$\Rightarrow a + c = ?$

A) -3 B) -2 C) -1 D) 1 E) 2

4. $A = \begin{bmatrix} 3 & 1 \\ b & 2 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 2 & c \\ -5 & d \end{bmatrix}$

$\Rightarrow b + c + d = ?$

A) -5 B) -1 C) 3 D) 5 E) 7

5. $A = \begin{bmatrix} 3x & 2 \\ x & 1 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} -1 & 2 \\ -1 & 3 \end{bmatrix}$

$\Rightarrow x = ?$

A) 2 B) $\frac{3}{2}$ C) 1 D) $-\frac{1}{2}$ E) -1

6. $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 5 & 3 \\ 2 & 1 \end{bmatrix}$

$\Rightarrow (A \cdot B)^{-1} = ?$

A) $\begin{bmatrix} -3 & 3 \\ 5 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 3 & -3 \\ 5 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 3 & 3 \\ 5 & 0 \end{bmatrix}$ D) $\begin{bmatrix} 3 & -3 \\ 1 & 5 \end{bmatrix}$ E) $\begin{bmatrix} -4 & 3 \\ 7 & -5 \end{bmatrix}$

7. $A = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow B^{-1}(A \cdot B) = ?$

A) $\begin{bmatrix} 3 & 11 \\ -1 & -4 \end{bmatrix}$ B) $\begin{bmatrix} 3 & 11 \\ 1 & 4 \end{bmatrix}$ C) $\begin{bmatrix} -3 & -11 \\ -1 & -4 \end{bmatrix}$ D) $\begin{bmatrix} -3 & -11 \\ 1 & 4 \end{bmatrix}$ E) $\begin{bmatrix} -3 & -11 \\ 4 & 1 \end{bmatrix}$

8. $A = \begin{bmatrix} a & -1 \\ b & 1 \end{bmatrix}$ $A^2 = A \cdot A^{-1}$

$\Rightarrow a + b = ?$

A) -1 B) 0 C) 1 D) 2 E) 3

9. $A=[a_{ij}]_{2x2}$ $\begin{bmatrix}3 & 1\\7 & 4\end{bmatrix}\cdot A=\begin{bmatrix}6 & 7\\4 & -2\end{bmatrix}$

$\Rightarrow A=?$

A) $\begin{bmatrix}4 & -6\\-6 & -11\end{bmatrix}$ B) $\begin{bmatrix}-4 & 6\\-6 & -11\end{bmatrix}$ C) $\begin{bmatrix}4 & 6\\-6 & -11\end{bmatrix}$

D) $\begin{bmatrix}4 & 6\\6 & 11\end{bmatrix}$ E) $\begin{bmatrix}4 & -6\\6 & -11\end{bmatrix}$

10. $A=[a_{ij}]_{2x2}$ $\begin{bmatrix}6 & 3\\-3 & 0\end{bmatrix}\cdot A=\begin{bmatrix}-12 & 33\\3 & -12\end{bmatrix}$

$\Rightarrow A=?$

A) $\begin{bmatrix}2 & -3\\4 & -1\end{bmatrix}$ B) $\begin{bmatrix}2 & -3\\-4 & 1\end{bmatrix}$ C) $\begin{bmatrix}-2 & 3\\-1 & 4\end{bmatrix}$

D) $\begin{bmatrix}-1 & 4\\-2 & 3\end{bmatrix}$ E) $\begin{bmatrix}-4 & 1\\-3 & 2\end{bmatrix}$

11. $A=[a_{ij}]_{2x2}$ $A\cdot\begin{bmatrix}2 & 2\\5 & -3\end{bmatrix}=\begin{bmatrix}19 & -5\\9 & 1\end{bmatrix}$

$\Rightarrow A=?$

A) $\begin{bmatrix}2 & 3\\2 & 1\end{bmatrix}$ B) $\begin{bmatrix}-2 & \frac{5}{2}\\5 & -2\end{bmatrix}$ C) $\begin{bmatrix}2 & 2\\5 & \frac{5}{2}\end{bmatrix}$

D) $\begin{bmatrix}2 & \frac{5}{2}\\5 & -2\end{bmatrix}$ E) $\begin{bmatrix}\frac{5}{2} & 2\\5 & 2\end{bmatrix}$

12. $A=[a_{ij}]_{2x2}$ $A\cdot\begin{bmatrix}-1 & 1\\2 & 3\end{bmatrix}=\begin{bmatrix}6 & 14\\7 & 18\end{bmatrix}$

$\Rightarrow A=?$

A) $\begin{bmatrix}5 & 4\\-11 & -18\end{bmatrix}$ B) $\begin{bmatrix}-18 & 4\\-11 & 5\end{bmatrix}$ C) $\begin{bmatrix}2 & 4\\3 & 5\end{bmatrix}$

D) $\begin{bmatrix}4 & -18\\5 & -11\end{bmatrix}$ E) $\begin{bmatrix}4 & 18\\5 & 11\end{bmatrix}$

13. $A=\begin{bmatrix}3 & a\\b & -3\end{bmatrix}$ $A^{-1}=A$

$\Rightarrow a\cdot b=?$

A) -9 B) -8 C) -3 D) 3 E) 8

14. $A=\begin{bmatrix}2 & 3\\a & b\end{bmatrix}$ $A=A^{-1}$

$\Rightarrow a+b=?$

A) -3 B) -2 C) -1 D) 1 E) 2

15. $A=\begin{bmatrix}x & -3\\5 & y\end{bmatrix}$ $A=A^{-1}$

$\Rightarrow |x|=?$

A) 1 B) 2 C) 3 D) 4 E) 5

16. $x>0$

$A=\begin{bmatrix}-1 & -x\\x-1 & 1\end{bmatrix}$ $A=A^{-1}$

$\Rightarrow x=?$

A) 1 B) 2 C) 3 D) 4 E) 5

1. $A = [a_{ij}]_{4x3}$
$B = [b_{ij}]_{5xa}$
$B \cdot A = [c_{ij}]_{mxn}$
$\Rightarrow a = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

2. $A = \begin{bmatrix} 5 & 2 \\ 4 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 4 & y \\ x+y & 3 \end{bmatrix}$ $C = \begin{bmatrix} 9 & 5 \\ 6 & 2 \end{bmatrix}$

$A + B = C$ $\Rightarrow x \cdot y = ?$

A) –3 B) –1 C) 0 D) 1 E) 3

3. $a \in R^+$

$A = \begin{bmatrix} -3 & -a \\ a & 3 \end{bmatrix}$

$A^2 = I$ $\Rightarrow a = ?$

A) 1 B) $\sqrt{2}$ C) $2\sqrt{2}$ D) $\sqrt{3}$ E) 3

4. $2A + B = \begin{bmatrix} 6 & 9 \\ -5 & 15 \end{bmatrix}$ $3A - B = \begin{bmatrix} 14 & 26 \\ -5 & 0 \end{bmatrix}$

$\Rightarrow B = ?$

A) $\begin{bmatrix} 9 & -5 \\ 2 & -1 \end{bmatrix}$ B) $\begin{bmatrix} -2 & -5 \\ -1 & 9 \end{bmatrix}$ C) $\begin{bmatrix} 4 & 7 \\ -1 & 3 \end{bmatrix}$

D) $\begin{bmatrix} -2 & 3 \\ 4 & 7 \end{bmatrix}$ E) $\begin{bmatrix} -2 & -1 \\ -5 & 9 \end{bmatrix}$

5. $\begin{bmatrix} 3 & 2 \\ 2 & 3 \\ -1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & -2 & 3 \\ 1 & 0 & 2 \end{bmatrix} = \begin{bmatrix} a & \cdot & \cdot \\ \cdot & b & \cdot \\ \cdot & \cdot & c \end{bmatrix}$

$\Rightarrow a + b + c = ?$

A) 12 B) 8 C) 4 D) 0 E) – 2

6. $A = \begin{bmatrix} 1 & -1 \\ 3 & 1 \end{bmatrix}$ $f(x) = x^2 - 2x - 3$

$\Rightarrow f(A) = ?$

A) $\begin{bmatrix} -2 & -1 \\ 3 & -2 \end{bmatrix}$ B) $\begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ C) $\begin{bmatrix} -7 & 0 \\ 0 & -7 \end{bmatrix}$

D) $\begin{bmatrix} -10 & -8 \\ 0 & -14 \end{bmatrix}$ E) $\begin{bmatrix} 4 & -2 \\ 6 & 4 \end{bmatrix}$

7. $A = \begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$ $\Rightarrow A^{25} = ?$

A) $\begin{bmatrix} 1 & -25 \\ 0 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & -24 \\ 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 25 & 0 \\ 0 & 25 \end{bmatrix}$

D) $\begin{bmatrix} 1 & -50 \\ 0 & 1 \end{bmatrix}$ E) $\begin{bmatrix} -24 & 0 \\ 0 & -24 \end{bmatrix}$

8. $A = \begin{bmatrix} a & 4 \\ -2 & b \end{bmatrix}$ $A = A^{-1}$

$\Rightarrow a \cdot b = ?$

A) – 4 B) – 6 C) – 8 D) – 9 E) –10

9. $A = \begin{bmatrix} -2 & 1 & a \\ a & 0 & 0 \\ 0 & a & 0 \end{bmatrix}$ $\quad |A| = -64$

$\Rightarrow a = ?$

A) 2 B) 1 C) – 3 D) – 4 E) – 5

10. $3x^2 - 6x + 4 = 0$ $\quad$ Ç.K. = $\{x_1, x_2\}$

$\Rightarrow \begin{vmatrix} 3x_1 & -x_2 \\ 3x_2 & x_1 \end{vmatrix} = ?$

A) 40 B) 20 C) 10 D) 4 E) 1

11. $a, b \in R$

$\Rightarrow \begin{vmatrix} 1 & b & a \\ 2 & b & a \\ 3 & b & 2a \end{vmatrix} = ?$

A) 0 B) – ab C) – 3ab D) ab E) 3ab

12. $x, y \in R$

$x \star y = \begin{vmatrix} x \cdot y & x + y \\ \frac{y}{x} & \log_x y \end{vmatrix}$

$\Rightarrow 3 \star 9 = ?$

A) – 18 B) – 9 C) 0 D) 9 E) 18

13. $\begin{vmatrix} 2012 & 2013 \\ 2010 & 2011 \end{vmatrix} = ?$

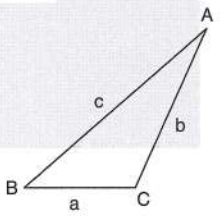
A) – 2 B) – 1 C) 0 D) 1 E) 2

14. $A = \begin{bmatrix} \cos 10° & \sin 10° \\ \cos 70° & \sin 70° \end{bmatrix}$

$\Rightarrow \det A = ?$

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) 1 D) $-\frac{\sqrt{3}}{2}$ E) $-\frac{1}{2}$

15.



a = 3 br
b = 7 br
c = 9 br

$A = \begin{bmatrix} 4 & 5 & 6 \\ a & b & c \\ \sin\widehat{A} & \sin\widehat{B} & \sin\widehat{C} \end{bmatrix}$

$\Rightarrow \det(A^T) = ?$

A) 0 B) $\sin\widehat{A}$ C) $\sin\widehat{B}$ D) 30 E) $\sin\widehat{C}$

16. $A = [1 \quad -1 \quad 3 \quad 5]$

$B = [1 \quad -2 \quad -7 \quad 4]$

$\Rightarrow \det(A \cdot B^T) = ?$

A) 1 B) 2 C) 3 D) 4 E) 5

1. $C = [c_{ij}]_{2x2}$

$A = \begin{bmatrix} -1 & -3 \\ 2 & 5 \end{bmatrix}$ $B = \begin{bmatrix} -2 & 1 \\ 3 & -2 \end{bmatrix}$

$A \cdot C = B$ $\Rightarrow C = ?$

A) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ B) $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ C) $\begin{bmatrix} -1 & 1 \\ 1 & 0 \end{bmatrix}$

D) $\begin{bmatrix} -1 & -1 \\ 1 & 0 \end{bmatrix}$ E) $\begin{bmatrix} 0 & -1 \\ -1 & -1 \end{bmatrix}$

2. $x^2 + 3x + m = 0$ Ç.K. $= \{x_1, x_2\}$

$\begin{bmatrix} 2 & 3 \\ 0 & x_1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ -3 & x_2 \end{bmatrix} = \begin{bmatrix} -7 & -6 \\ 3 & m \end{bmatrix}$

$\Rightarrow m = ?$

A) -7 B) -6 C) -5 D) 2 E) 7

3. $\begin{vmatrix} 3 & 6 \\ 4 & |2x-3| \end{vmatrix} = 6$

$\Rightarrow \sum x = ?$

A) 3 B) $\frac{7}{2}$ C) 4 D) $\frac{11}{2}$ E) $\frac{13}{2}$

4. $A = \begin{bmatrix} -2 & 1 \\ 0 & 2 \end{bmatrix}$ $\Rightarrow A^{2013} = ?$

A) $2^{2012} \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ B) $2^{2013} \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

C) $2^{2013} \cdot \begin{bmatrix} -2 & 1 \\ 0 & 2 \end{bmatrix}$ D) $2^{2012} \cdot \begin{bmatrix} -2 & 1 \\ 0 & 2 \end{bmatrix}$

E) $2^{2013} \cdot \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$

5. $A = \begin{bmatrix} \ln x & 2 \\ \ln y & 3 \end{bmatrix}$ $A^2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow \frac{x}{y} = ?$

A) $-\frac{e}{2}$ B) 0 C) $\frac{e}{2}$ D) e E) 2

6. $A = \begin{bmatrix} -1 & -4 \\ a & 2 \end{bmatrix}$ $\det(A) = 6$

$\Rightarrow \lim\limits_{x \to a} \left(\frac{x^2 - x - 2}{x - 2} \right) = ?$

A) 2 B) 3 C) 4 D) 5 E) 6

7. $A = [a_{ij}]_{2x2}$ $a_{ij} = \begin{cases} i - j & i \neq j \\ i + j & i = j \end{cases}$

$\Rightarrow \det(A) = ?$

A) 4 B) 6 C) 7 D) 9 E) 10

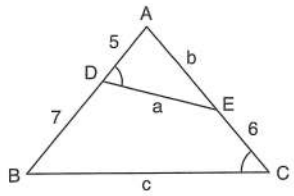
8. $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$

$\Rightarrow A^3 - 3A^2 + 3A - I = ?$

A) $\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ B) $2 \cdot \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ C) $2^2 \cdot \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$

D) $2^3 \cdot \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ E) $-2^3 \cdot \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

9. $m(\widehat{ADE}) = m(\widehat{ACB})$



$$\Rightarrow \begin{vmatrix} a & 5 & b \\ c & b+6 & 12 \\ b & 5 & 6 \end{vmatrix} = ?$$

A) $b^2 + 6b - a$ B) $ab + 6a - 5c$ C) 0 D) $40 \cdot (a + b)$ E) $60 \cdot (b - c)$

10. $A = \begin{bmatrix} 6 & -3 \\ 3 & -2 \end{bmatrix}$

$\Rightarrow A - A^{-1} = ?$

A) $\begin{bmatrix} \frac{20}{3} & -4 \\ 4 & -4 \end{bmatrix}$ B) $\begin{bmatrix} \frac{2}{3} & -2 \\ 2 & -2 \end{bmatrix}$ C) $\begin{bmatrix} -\frac{2}{3} & 1 \\ -1 & 2 \end{bmatrix}$ D) $\begin{bmatrix} -2 & 3 \\ -3 & 6 \end{bmatrix}$ E) $\begin{bmatrix} \frac{16}{3} & -2 \\ 2 & 0 \end{bmatrix}$

11. $A = \begin{bmatrix} 3 & -3 \\ 4 & -3 \end{bmatrix}$ $B = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$

$A^{-1} \cdot X = B - X$

$\Rightarrow X = ?$

A) $\begin{bmatrix} \frac{9}{4} \\ 1 \end{bmatrix}$ B) $\begin{bmatrix} \frac{3}{4} \\ 3 \end{bmatrix}$ C) $\begin{bmatrix} -\frac{9}{4} \\ -1 \end{bmatrix}$ D) $\begin{bmatrix} \frac{9}{4} & -1 \end{bmatrix}$ E) $\begin{bmatrix} -\frac{9}{4} & 1 \end{bmatrix}$

12. $A = \begin{bmatrix} a-b & 3 \\ a+b & 2 \end{bmatrix}$ $A = A^T$

$\Rightarrow a + b = ?$

A) $\frac{1}{2}$ B) $\frac{5}{4}$ C) $\frac{5}{2}$ D) 3 E) $\frac{7}{2}$

13. $A = \begin{bmatrix} x & x+y \\ 2 & 3 \end{bmatrix}$ $A = A^{-1}$

$\Rightarrow x \cdot y = ?$

A) -3 B) -1 C) 0 D) 3 E) 6

14. $f(x) = \begin{vmatrix} \cot(11x) & \cos(9x) \\ \sin(9x) & \tan(11x) \end{vmatrix}$

$\Rightarrow f\left(\frac{\pi}{18}\right) = ?$

A) -2 B) -1 B) 0 D) 1 E) 2

15. $\begin{vmatrix} a-3 & 5^{\log_5 3} \\ \prod_{k=3}^{4}\left(\frac{k+1}{k}\right) & a+1 \end{vmatrix} = 0$

$\Rightarrow$ S.S. = ?

A) $\{-2, 2\}$ B) $\{-2, 0\}$ C) $\{-2, 4\}$ D) $\{-4, 0\}$ E) $\{-4, 2\}$

16. $A = \begin{bmatrix} 3 & 3 \\ m & 3 \\ -2 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ $A \cdot B = [a_{ij}]$

$\sum a_{ij} = -3$ $\Rightarrow m = ?$

A) -16 B) -14 C) -8 D) -6 E) -2

MATRİS
MATRIX

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	C	D	A	C	C	E	D	B	A	E	D	E	D	B	B

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	D	E	C	D	C	D	D	E	D	A	E	C	D	C	D

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	D	A	E	C	B	B	E	D	B	D	A	C	A	B

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	C	D	E	C	A	D	A	A	C	E	D	A	E	D	D

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	B	E	D	D	A	E	E	E	E	B	E	C	E	A	C

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	E	A	E	C	E	D	A	B	C	B	E	E	C	E	D

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	E	B	C	A	D	C	A	D	B	E	A	B	D	A	A

TEST 8

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	C	B	D	A	C	A	C	C	E	D	B	B	C	C	A

TEST 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	D	E	B	E	D	B	B	E	C	D	E	D	E	C

TEST 10

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	C	E	E	E	D	A	C	D	A	C	B	A	D	A

TEST 11

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	A	C	B	E	C	D	D	D	D	B	E	E	B	A	B

TEST 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	D	A	D	D	B	D	D	C	E	B	D	D	D	C	C

PERMÜTASYON
KOMBİNASYON-BİNOM
OLASILIK

PERMUTATION-COMBINATION
BINOMIAL-PROBABILITY

ÖZELLİK | Property 1

Saymanın Temel Prensipleri
The Basic Counting Principals

- İki ayrı olaydan biri "m" farklı şekilde, diğeri "n" farklı şekilde yapılabilirse; bu olaylardan biri veya diğeri (m + n) kadar farklı şekilde yapılabilir.

  When there are 'm' ways to do one thing, and 'n' ways to do another, then there are (m+n) ways of doing either of them.

- İki ayrı olaydan biri "m" farklı şekilde, diğeri "n" farklı şekilde yapılabilirse; bu iki olay birlikte "m · n" farklı şekilde yapılabilir.

  When there are 'm' ways to do one thing, and 'n' ways to do another, then there are (mxn) ways of doing both of them.

- Seçme işlemlerinde seçilecek olan nesnelerin aynı veya farklı olması, seçim durumunu değiştirir.

  In the event of the object to be same or different changes the selection situation.

1. 4 farklı gömlekten 1 gömlek kaç farklı şekilde seçilebilir?

1 shirt is to be selected among 4 different shirts. In how many ways can it be done? **4**

2. 4 aynı gömlekten 1 gömlek kaç farklı şekilde seçilebilir?

1 shirt is to be selected among 4 similar shirts. In how many ways can it be done? **1**

3. 4 **farklı** pantolonu ve 7 **farklı** gömleği olan bir kişi, 1 pantolon **veya** 1 gömleği kaç farklı şekilde seçebilir?

A person has 4 different trousers and 7 different shirts in how many ways can he choose 1 trouser or 1 shirt? **11**

4. 4 **farklı** pantolonu ve 7 **farklı** gömleği olan bir kişi, 1 pantolon **ve** 1 gömleği kaç farklı şekilde seçebilir?

A person has 4 different trousers and 7 different shirts in how many ways can he choose 1 trouser and 1 shirt? **28**

5. 4 **aynı** pantolonu ve 7 **aynı** gömleği olan biri, 1 pantolon **veya** 1 gömleği kaç farklı şekilde seçebilir?

A person has 4 similar trousers and 7 similar shirts in how many ways can he choose 1 trouser or 1 shirt? **2**

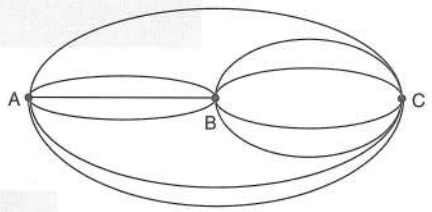
6. 4 **aynı** pantolonu ve 7 **aynı** gömleği olan bir kişi, 1 pantolon **ve** 1 gömleği kaç farklı şekilde seçebilir?

A person has 4 similar trousers and 7 similar shirts in how many ways can he choose 1 trouser and 1 shirt? **1**

7. Bir kutuda bulunan 3 farklı kırmızı kalem, 5 farklı mavi kalem ve 8 farklı siyah kalemden, her renkten bir kalem almak koşuluyla 3 kalem kaç farklı şekilde seçilebilir?

In how many different ways 3 pencils will be chosen among 3 different red pencils, 5 different blue pencils and 8 different black pencils in such a way that only one pencil can be selected from each color. **120**

8.



a) A'dan C'ye, "B'den geçmek koşuluyla" kaç farklı biçimde gidilebilir?

In how many ways can you go from A to C on condition that you pass from B? **12**

b) A'dan C'ye kaç farklı biçimde gidilebilir?

In how many ways can you go from A to C? **15**

c) A'dan C'ye kaç farklı biçimde gidilip tekrar geri dönülebilir?

In how many ways can you go from A to C and return back? **225**

d) Geçilen yol tekrar kullanılmamak şartıyla kaç farklı biçimde A'dan C'ye gidilip tekrar geri dönülebilir?

In how many ways can be gone from A to C in such a way that the same road can not be used in return? **150**

9. A = {1, 2, 3, 4, 5, 6, 7}

A kümesinin elemanlarıyla farklı;

Different from the elements of Set A;

a) 3 basamaklı kaç sayı yazılabilir?

How many 3 digit numbers can be written? 7^3

b) 4 basamaklı kaç sayı yazılabilir?

How many 4 digit numbers can be written? 7^4

c) 3 basamaklı kaç çift sayı yazılabilir?

How many even numbers with 3 digits can be written? 147

d) 3 basamaklı kaç tek sayı yazılabilir?

How many odd numbers with 3 digits can be written? 196

e) 3 basamaklı, rakamları farklı kaç sayı yazılabilir?

How many 3 digit numbers can be written in such a way that all the numbers will be different? 210

f) 3 basamaklı, rakamları farklı, kaç çift sayı yazılabilir?

How many even numbers with 3 digits can be written in such a way that all the numbers will be different? 90

g) 3 basamaklı, rakamları farklı, kaç tek sayı yazılabilir?

How many odd numbers with 3 digit can be written in such a way that all the numbers will be different? 120

h) 3 basamaklı, rakamları farklı, 300'den büyük kaç sayı yazılabilir?

How many 3 digit numbers bigger than 300 can be written in such a way that all the numbers will be different? 150

i) 3 basamaklı, rakamları farklı, 300'den büyük kaç çift sayı yazılabilir?

How many 3 digit even numbers bigger than 300 can be written in such a way that all the numbers will be different? 65

10. A = {0, 1, 2, 3, 4, 5, 6}

A kümesinin elemanlarıyla farklı;

Different from the elements of Set A;

a) 3 basamaklı kaç sayı yazılabilir?

How many 3 digit numbers can be written? 294

b) 4 basamaklı kaç sayı yazılabilir?

How many 4 digit numbers can be written? $6 \cdot 7^3$

c) 3 basamaklı kaç çift sayı yazılabilir?

How many even numbers with 3 digits can be written? 168

d) 3 basamaklı kaç tek sayı yazılabilir?

How many odd numbers with 3 digits can be written? 126

e) 3 basamaklı, rakamları farklı kaç sayı yazılabilir?

How many 3 digit numbers can be written in such a way that all the numbers will be different? 180

f) 3 basamaklı, rakamları farklı, kaç çift sayı yazılabilir?

How many even numbers with 3 digits can be written in such a way that all the numbers will be different? 105

g) 3 basamaklı, rakamları farklı, kaç tek sayı yazılabilir?

How many odd numbers with 3 digit can be written in such a way that all the numbers will be different? 75

h) 3 basamaklı, rakamları farklı, 300'den büyük kaç sayı yazılabilir?

How many 3 digit numbers bigger than 300 can be written in such a way that all the numbers will be different? 120

i) 3 basamaklı, rakamları farklı, 300'den büyük kaç çift sayı yazılabilir?

How many 3 digit even numbers bigger than 300 can be written in such a way that all the numbers will be different? 70

ÖZELLİK | Property 2

Permütasyon | Permutation

$n, r \in N$

$r \leq n$

Matematikte permütasyon, her sembolün sadece bir veya birkaç kez kullanıldığı sıralı bir dizidir.

n elemanlı bir kümeden seçilen r elemanlı permütasyonların toplamı ($n \geq r$ olmak şartıyla) aşağıdaki formülle ifade edilir.

$$P(n, r) = \frac{n!}{(n-r)!}$$

In Maths, permutation is a sequence in an order where each symbol is used only for once or for several times.

The sum of permutations with r elements which are chosen from a set with n elements is shown with the formula of

$$P(n, r) = \frac{n!}{(n-r)!}$$

- $P(n, n) = n!$
- $P(n, 1) = n$
- $P(n, 0) = 1$

1. 9 kişinin katıldığı bir yarışta ilk iki derece kaç farklı biçimde oluşturulabilir?

In how many ways can the first two rank be formed in a race with 9 participants?

72

2. 5 farklı kitap düz bir rafa yan yana kaç farklı şekilde dizilebilir?

In how many ways can 5 different books be placed side by side on a flat shelf?

5!

3. 6 farklı tişört bir vitrinde kaç farklı şekilde sergilenebilir?

In how many ways can 6 shirts be displayed in the showcase?

6!

4. 3 farklı matematik, 4 farklı fizik ve 2 farklı kimya kitabı düz bir rafa;

On a flat shelf 3 different maths books, 3 different physics books and 2 different chemistry Books;

a) Koşulsuz kaç farklı biçimde dizilebilir?

Without any condition in how many ways can they be put?

9!

b) Aynı tür kitaplar yanyana kaç farklı biçimde dizilebilir?

In how many ways can they be put in such a way that same genre will be side by side?

$3! \cdot 3! \cdot 4! \cdot 2!$

c) Fizik kitapları yanyana kaç farklı biçimde dizilebilir?

In how many ways can physics books be put side by side?

$6! \cdot 4!$

d) Başta ve sonda kimya kitabı olması koşuluyla kaç farklı biçimde dizilebilir?

In how many ways can they be put in such a way that first book and the last book will be chemistry book?

$2! \cdot 7!$

e) Başta ve sonda matematik kitabı olması koşuluyla kaç farklı biçimde dizilebilir?

In how many ways can they be put in such a way that first book and the last book will be maths book?

$3 \cdot 2 \cdot 7!$

f) Herhangi iki fizik kitabı yanyana olmamak koşuluyla kaç farklı biçimde dizilebilir?

In how many ways can they be put in such a way that physics books will not be side by side?

$360 \cdot 5!$

ÖZELLİK | Property 3

Dairesel Permütasyon | Circular Permutation

- n farklı elemanın dairesel sıralamasına, n elemanın dairesel permütasyonu denir. Dairesel permütasyonda bir eleman sabit tutulur. n elemanlı bir kümenin dairesel permütasyon sayısı (n – 1)! dir.

  Circular ordering of n different element is called circular permutation of n. In circular permutation one element is kept constant. The number of the circular permutation of a set with n elements is (n-1)!

- n farklı eleman çember şeklindeki halkaya $\frac{(n-1)!}{2}$ farklı şekilde dizilebilir.

  n different element can be aligned around a ring in $\frac{(n-1)!}{2}$ different ways.

ÖZELLİK | Property 4

Tekrarlı Permütasyon | Repeated Permutation

n tane nesnenin k_1 tanesi birinci çeşitten, k_2 tanesi ikinci çeşitten, ... k_r tanesi r'inci çeşitten olmak üzere;

$$n = k_1 + k_2 + ... + k_r$$

ise bu n tane nesnenin n'li permütasyonların sayısı:

$$\frac{n!}{(k_1!)\cdot(k_2!)\cdot .....\cdot(k_r!)}$$

If k_1 of n objects is from the first kind, k_2 is from second kind, ... k_r is from r kind; and if $n = k_1 + k_2 + ... + k_r$ the number of permutation with n of n elements is

$$\frac{n!}{(k_1!)\cdot(k_2!)\cdot .....\cdot(k_r!)}$$

1. Anne, baba ve 4 çocuktan oluşan bir aile, yuvarlak bir masa etrafına;

A family with a mother, a father and 4 children around a round table;

a) Koşulsuz kaç farklı biçimde oturabilir? $\boxed{5!}$

Without any condition in how many ways can they sit?

b) Anne ile baba yanyana olmak koşuluyla, kaç farklı biçimde oturabilir? $\boxed{4!\cdot 2!}$

In how many ways can they sit together in such a way that the mother and the father will sit side by side?

c) Anne ile baba yanyana olmamak koşuluyla kaç farklı biçimde oturabilir? $\boxed{5! - 4!\cdot 2!}$

In how many ways can they sit together in such a way that the mother and the father will not sit side by side?

2. 7 farklı anahtar, bir çembere kaç farklı biçimde dizilebilir? $\boxed{\frac{6!}{2}}$

In how many ways can 7 different keys be aligned around a ring?

1. KELEBEK kelimesinin harfleri ile anlamlı ya da anlamsız 7 harfli kaç farklı kelime yazılabilir? $\boxed{\frac{7!}{2!\cdot 3!}}$

How many words with 7 letters be written from the letters of the word 'KELEBEK' and no matter it is meaningful or meaningless?

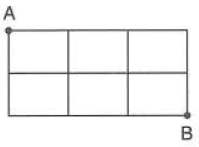
2. 324223 sayısının rakamları ile 6 basamaklı kaç farklı sayı yazılabilir? $\boxed{\frac{6!}{2!\cdot 3!}}$

How many different numbers with 6 digit can be written from number 324223?

3. 5001115 sayısının rakamları ile 7 basamaklı kaç farklı sayı yazılabilir? $\boxed{150}$

How many different numbers with 7 digit can be written from number 5001115?

4.



A'dan B'ye en kısa yoldan kaç farklı şekilde gidilebilir? $\boxed{10}$

In how many different ways can you go from A to B from the shortest road?

ÖZELLİK | Property 5

Kombinasyon | Combination

$n, r \in N$
$r \leq n$

n elemanlı bir kümenin r elemanlı alt kümelerinin her birine, kümenin r'li kombinasyonu denir.

n elemanlı bir kümenin r'li kombinasyonlarının sayısı:

$$C(n,r) = \binom{n}{r} = \frac{n!}{(n-r)!\cdot r!}$$

Each of the subsets with r elements of a set with n elements is called combination with r of a set with n elements.

$$C(n,r) = \binom{n}{r} = \frac{n!}{(n-r)!\cdot r!}$$

- Permütasyonda seçme ve sıralama (görevlendirme), kombinasyonda ise sadece seçme işlemi yapılır.
  In permutation selection and sequencing is done; in combination only selection is done.
- $C\binom{n}{r} = \frac{P(n,r)}{r!}$
- $\binom{n}{0} = 1$

  $\binom{n}{1} = n$

  $\binom{n}{n} = 1$
- $\binom{n}{r} = \binom{n}{k} \Rightarrow r = k$ ve $r + k = n$

  $n \in N$
- n elemanlı bir kümenin *(Of a set with n element)*

  0 elemanlı alt kümelerinin sayısı $\binom{n}{0}$
  The number of the subset with 0 element

  1 elemanlı alt kümelerinin sayısı $\binom{n}{1}$
  The number of the subset with 1 element

  2 elemanlı alt kümelerinin sayısı $\binom{n}{2}$
  The number of the subset with 2 element

  ⋮

  r elemanlı alt kümelerinin sayısı $\binom{n}{r}$
  The number of the subset with r element

  ⋮

  n elemanlı alt kümelerinin sayısı $\binom{n}{n}$
  The number of the subset with n element

  Tüm alt kümelerinin sayısı
  (The number of all the subsets)

  $$\binom{n}{0} + \binom{n}{1} + \binom{n}{2} + \ldots + \binom{n}{n} = 2^n$$

$A = \{a, b, c, d, e, f, g\}$

1. A kümesinin 3 elemanlı kaç farklı alt kümesi vardır?
How many different subsets with 3 elements are there in A set?

35

2. A kümesinin 2 elemanlı kaç farklı alt kümesi vardır?
How many different subsets with 2 elements are there in A set?

21

3. A kümesinin tüm alt kümelerinin sayısı kaçtır?
What is the number of all subsets of A set?

2^7

4. A kümesinin **en az** 3 elemanlı alt kümelerinin sayısı kaçtır?
How many subsets with at least 3 elements are there in A set?

99

5. A kümesinin **en çok** 3 elemanlı alt kümelerinin sayısı kaçtır?
How many subsets with at most 3 elements are there in A set?

64

6. A = {a, b, c, d, e, f, g, h}

A kümesinin alt kümelerinin kaçında;

In how many of the subsets of set A;

a) "a" vardır?
There is 'a'? 2^7

b) "a" yoktur?
There isn't 'a'? 2^7

c) "a" vardır ve "b" yoktur?
There is 'a' and there isn't 'b'? 2^6

d) "a" ve "b" vardır?
There are both 'a' and 'b'? 2^6

e) "a" ve "b" yoktur?
There is neither 'a' nor 'b'? 2^6

f) "a" veya "b" vardır?
There is 'a' or 'b'? $3 \cdot 2^6$

g) "a" ya da "b" vardır?
There isn't 'a' or 'b'? 2^7

7. A = {a, b, c, d, e, f, g, h, k}

A kümesinin 4 elemanlı alt kümelerinin kaçında;

In how many of the subsets with 4 elements of set A;

a) "a" vardır?
There is 'a'? 56

b) "a" yoktur?
There isn't 'a'? 70

c) "a" vardır ve b yoktur?
There is 'a' and there isn't 'b'? 35

d) "a" ve "b" vardır?
There are both 'a' and 'b'? 21

e) "a" ve "b" yoktur?
There is neither 'a' nor 'b'? 35

f) "a" veya "b" vardır?
There is 'a' or 'b'? 91

g) "a" ya da "b" vardır?
There isn't 'a' or 'b'? 70

ÖZELLİK | Property 6

n farklı elemandan r tane eleman
r elements from n different elements

$$\binom{n}{r} = \frac{n!}{(n-r)! \cdot r!}$$

farklı biçimde seçilebilir.
can be chosen differently

1. 10 kişilik bir gruptan 3 kişilik bir ekip kaç farklı şekilde seçilebilir?

In how many different ways can 3 people be selected from a group of 10?

120

2. 7 farklı kalemden 2 kalem kaç farklı biçimde seçilebilir?

In how many different ways can 2 pencils be selected from 7 different pencils?

21

3. 8 aynı gömlekten 3 gömlek kaç farklı biçimde seçilebilir?

In how many different ways can 3 shirts be selected from 8 different shirts?

1

4. {1, 2, 3, 4, 5, 6} kümesinin elemanlarıyla abc biçiminde üç basamaklı sayılar yazılacaktır. a > b > c şartıyla kaç farklı sayı yazılabilir?

In how many ways can 3 digit numbers as a,b,c can be written by using the elements of the set (1, 2, 3, 4, 5, 6) in condition that a > b > c ?

20

5. 4 erkek ve 6 kızdan oluşan bir gruptan;

From a group of 4 boys and 6girls;

a) 3 kişilik bir ekip kaç farklı şekilde seçilebilir?

In how many ways can a group of 3 people be selected?

120

b) Ekipte en az bir erkek olması koşuluyla 3 kişilik ekip kaç farklı şekilde seçilebilir?

3 persons are to be selected so that there will be at least 1 boy on the committee. In how many ways can it be done?

100

6. 4 avukat, 5 doktor ve 3 öğretmen arasından;

From 4 lawyers, 5 doctors and 3 teachers;

a) 2 kişi kaç farklı biçimde seçilebilir?

In how many different ways can 2 people be selected?

66

b) Her meslekten en az bir kişi olması koşuluyla 5 kişi kaç farklı biçimde seçilebilir?

5 persons are to be selected so that there will be at least 1 person from the same proffession. In how many different ways can it be done?

2160

c) Seçilen kişiler arasında en az bir avukat olması koşuluyla 3 kişi kaç farklı şekilde seçilebilir?

3 persons are to be selected so that there will be at least 1 lawyer. In how many different ways can it be done?

164

7. 10 kişiden 4 kişi sinemaya, 6 kişi tiyatroya kaç farklı şekilde gidebilir?

Out of 10; 4 people want to go the cinema and 6 people want to go the theatre. In how many different ways can it be done?

210

ÖZELLİK | Property 7

Herhangi üçü doğrusal olmayan n farklı nokta

n different point any 3 of which are non linear

a) $\binom{n}{2}$ farklı doğru belirtir. *(indicates another line)*

b) $\binom{n}{3}$ farklı üçgen belirtir. *(indicates another triangle)*

c) $\binom{n}{4}$ farklı dörtgen belirtir. *(indicates another quadrangle)*

1. Herhangi üçü doğrusal olmayan 10 farklı nokta;

10 different points any 10 of which are non linear;

a) Kaç farklı doğru belirtir?

How many different line does it define? 45

b) Kaç farklı üçgen belirtir?

How many different triangle does it define? 120

c) Kaç farklı dörtgen belirtir?

How many different quadrilateral does it define? 210

2. 4'ü bir doğru üzerinde ve 5'i de doğru dışında herhangi üçü de doğrusal olmayan 9 farklı nokta;

From 9 points; 4 of them on a line, non linear 5 of them out of line;

a) Kaç farklı doğru belirtir?

How many line do they define? 31

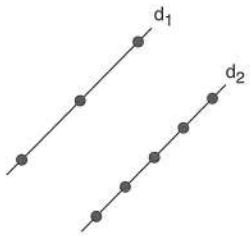
b) Kaç farklı üçgen belirtir?

How many triangle do they define? 80

c) Kaç farklı dörtgen belirtir?

How many quadrilateral do they define? 105

3.



$d_1 // d_2$

3'ü d_1 doğrusunda, 5'i d_2 doğrusunda olmak üzeri 8 farklı nokta;

Total of 8 points; 3 of them on d_1 line, 5 of them on d_2 line;

a) Kaç farklı doğru belirtir?

How many different line does it define? 17

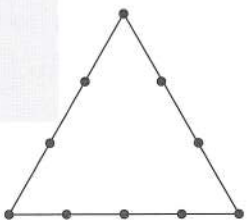
b) Kaç farklı üçgen belirtir?

How many different triangle does it define? 45

c) Kaç farklı dörtgen belirtir?

How many different quadrilateral does it define? 30

4.



Üçgen üzerinde belirtilen şekildeki 10 farklı nokta kaç farklı üçgen belirtir?

How many different triangle can be formed by joining 10 different points on the shape of triangle above?

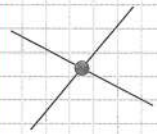
102

ÖZELLİK | Property 8

Şekil Kesiştirme | Intersection of Figures

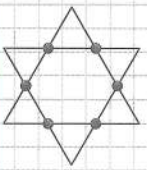
Şekil kesiştirme sorularında, şekiller ikili ikili kesiştirilir. Bunun için şekil sayısının 2'li kombinasyonu alınır. (Şekiller aynı kenara sahip olmamalıdır.)

In intersection of figures questions, the figures are intersected pairwise. For this, binary combination of the figure number is to be taken.



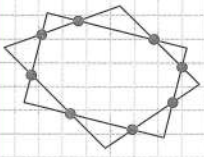
İki farklı doğru en fazla 1 noktada kesişir. n farklı doğru en fazla $\binom{n}{2}\cdot 1$ noktada kesişir.

Each different line intersects in one point. N different line intersects in $\binom{n}{2}\cdot 1$



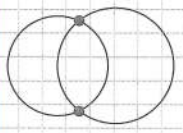
İki farklı üçgen en fazla 6 noktada kesişir. n farklı üçgen en fazla $\binom{n}{2}\cdot 6$ noktada kesişir.

Two different triangle intersects max. in 6 points. n different triangle intersects in $\binom{n}{2}\cdot 6$



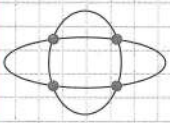
İki farklı konveks dörtgen en fazla 8 noktada kesişir. n farklı konveks dörtgen en fazla $\binom{n}{2}\cdot 8$ noktada kesişir.

Two different convex quadrilateral intersects max. in 8 points. n different convex quadrilateral intersects in $\binom{n}{2}\cdot 8$



İki farklı çember en fazla 2 noktada kesişir. n farklı çember en fazla $\binom{n}{2}\cdot 2$ noktada kesişir.

Two different circle intersects max. in 2 points. n different circle intersects in $\binom{n}{2}\cdot 2$



İki farklı elips en fazla 4 noktada kesişir. n farklı elips en fazla $\binom{n}{2}\cdot 4$ noktada kesişir.

Two different elips intersects max. in 4 points. n different elips intersects in $\binom{n}{2}\cdot 4$

1. Çakışık olmayan 8 farklı doğru en fazla kaç noktada kesişir?
What is the maximum number of points of intersection of 8 different non-overlapping straight lines?

28

2. Ortak kenara sahip olmayan 5 farklı üçgen en fazla kaç noktada kesişir?
What is the maximum number of points of intersection of 5 distinct triangles?

60

3. Farklı yarıçaplı 10 tane çember en fazla kaç farklı noktada kesişir?
What is the maximum number of points of intersection of 10 circles with different radius?

90

4. Ortak kenara sahip olmayan 6 farklı dörtgen en fazla kaç noktada kesişir?
What is the maximum number of points of intersection of 6 distinct quadrilateral?

120

5. 7 farklı elips, en fazla kaç farklı noktada kesişir?
What is the maximum number of points of intersection of 7 different elips?

84

6. 4'ü paralel 9 farklı doğru en fazla kaç noktada kesişir?
What is the maximum number of points of intersection of 9 different line if 4 of them are parallel?

30

7. 3'ü bir A noktasından geçen 7 farklı doğru, en fazla kaç farklı noktada kesişir?
What is the maximum number of points of intersection of 7 different line if 3 of them intersects point A?

19

8. 2'si paralel, 3'ü bir A noktasından geçen 8 farklı doğru, en fazla kaç farklı noktada kesişir?
What is the maximum number of points of intersection of 8 different line if 2 of them are parallel and 3 of them intersects point A?

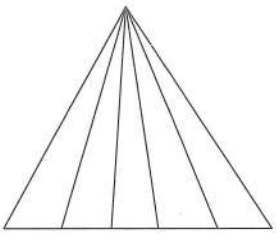
25

ÖZELLİK | Property 9

Üçgen için 3 farklı nokta gereklidir. Şekilde üçgen için gerekli olan sabit bir nokta seçilir. Geriye kalan 2 nokta kombinasyon yardımıyla bulunur.

For a triangle 3 points are needed. One constant point is selected on the figure. The other 2 points are found by the help of combination.

1.

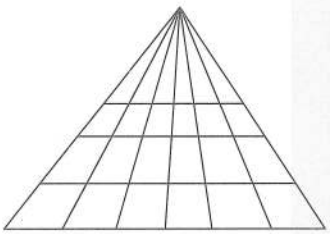


Şekilde kaç farklı üçgen vardır?

How many different triangles are there?

15

2.

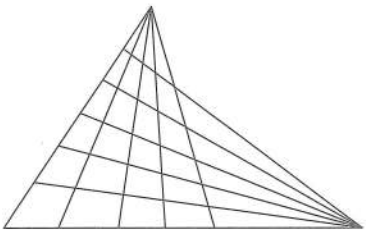


Şekilde kaç farklı üçgen vardır?

How many different triangles are there?

84

3.



Şekilde kaç farklı üçgen vardır?

How many different triangles are there?

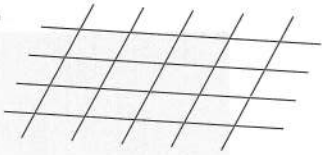
135

ÖZELLİK | Property 10

Paralelkenar için 4 nokta gereklidir. Paralelkenarda, kenarlar paralel olduğundan taban için 2 nokta ve yan kenar için 2 nokta kombinasyon yardımıyla seçilerek seçim durumları çarpılır.

For a parallelogram 4 points are needed. As the sides are parallel 2 points for the other side and 2 points for the base is found by the help of combination. And the number of combination is multiplied.

1.

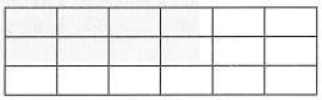


Şekilde kaç farklı paralelkenar vardır?

How many different parallelogram are there?

60

2.

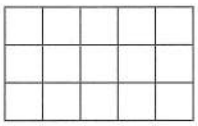


Şekilde kaç farklı dikdörtgen vardır?

How many different rectangle are there?

126

3.



Şekil eş karelerden oluşmuştur.

Figure is made up of identical squares.

a) Şekilde kaç farklı dikdörtgen vardır?

How many different rectangles are there?

90

b) Şekilde kaç farklı kare vardır?

How many different squares are there?

26

TANIM | Definition

Binom Açılımı | Binomial Expansion

$$(x+y)^n=\binom{n}{0}x^ny^0+\binom{n}{1}x^{n-1}y^1+\binom{n}{2}x^{n-2}y^2+.....+\binom{n}{r}x^{n-r}y^r+.....+\binom{n}{n}x^0y^n$$

Örnek | Example

$$(a+b)^2=\binom{2}{0}a^2b^0+\binom{2}{1}a^1b^1+\binom{2}{2}a^0b^2$$

$$(a+b)^3=\binom{3}{0}a^3b^0+\binom{3}{1}a^2b^1+\binom{3}{2}a^1b^2+\binom{3}{3}a^0b^3$$

$$(a+b)^4=\binom{4}{0}a^4b^0+\binom{4}{1}a^3b^1+\binom{4}{2}a^2b^2+\binom{4}{3}a^1b^3+\binom{4}{4}a^0b^4$$

ÖZELLİK | Property 11

$(x+y)^n=\binom{n}{0}x^ny^0+\binom{n}{1}x^{n-1}y^1+\binom{n}{2}x^{n-2}y^2+.....+\binom{n}{r}x^{n-r}y^r+.....+\binom{n}{n}x^0y^n$ açılımında *(in this expansion)*

- n + 1 tane terim vardır.
  (There are n + 1 term)
- Her terimdeki x ve y ifadelerinin üslerinin toplamı n'dir.
  The sum of exponential of x and y in every term is n.
- Katsayılarının toplamını bulmak için x ve y yerine "1" yazılır.
  In order to find the sum of factors '1' is written in the place of x and y.
- Sabit terimi bulmak için x ve y yerine "0" yazılır.
  In order to find the constant term '0' is written in the place of x and y.
- Açılım x'in azalan kuvvetlerine göre dizildiğinde baştan (r + 1)'inci terim $\binom{n}{r}x^{n-r}y^r$
  When expansion is aligned according to the decreasing power of 'x' the term (r+1) term from the beginning is $\binom{n}{r}x^{n-r}y^r$

$(2x + y)^{10}$ ifadesinin açılımında;
Expansion of expression $(2x+y)^{10}$;

1. Kaç terim vardır?
How many terms are there?

11

2. Katsayılar toplamı kaçtır?
What is the sum of powers?

3^{10}

3. Sabit terim kaçtır?
What is the constant term?

0

4. $(2x + y)^{10}$ ifadesinin açılımında; açılım x'in azalan kuvvetlerine göre dizildiğinden;
As the expansion of expression $(2x+y)^{10}$ is aligned according to the decreasing power of x;

a) Baştan 3. terim nedir?
What is the 3rd term from the beginning?

$\binom{10}{2}(2x)^8\cdot y^2$

b) Baştan 4. terim nedir?
What is the 4th term from the beginning?

$\binom{10}{3}(2x)^7\cdot y^3$

c) Sondan 3. terim nedir?
What is the 3rd term from the last?

$\binom{10}{2}y^8\cdot(2x)^2$

TANIM | Definition

Olasılık | Probability

Sonuç | Result:
Bir işlemin her bir çıktısına sonuç denir.
The outcome of all the operations is called result.

Örnek Uzay | Sample Space:
Bir işlemin tüm sonuçlarını eleman kabul eden kümedir.
A set which considers all the results of an operation as elements.

Olay | Event:
Bir örnek uzayın her bir alt kümesine olay denir.
Each subset of a sample space is called event.

P(A):
A olayının olma olasılığı
P(A): probability of occurrence of event A

$$P(A) = \frac{n(A)}{n(E)}$$

Örnek | Example

İki madeni para havaya atıldığında en az birinin tura gelmesi olayı incelenirse;
If a coin is flipped and the probability of at least one side is tail is analysed;

Örnek Uzay (E): {(Y,Y) (Y, T) (T, Y) (T, T)}
Sample Space

Olay (A): {(Y, T) (T, T) (T, Y)}
Event

$$P(A) = \frac{n(A)}{n(E)} = \frac{3}{4}$$

ÖZELLİK | Property 12

E örnek uzayında A ve B iki olay olsun.
Let A and B are two events in E sample space.

- $0 \le P(A) \le 1$
- $P(E) = 1$ (Kesin olay) *(Certain event)*
- $P(\emptyset) = 0$ (İmkansız olay) *(Impossible event)*
- $P(A') = 1 - P(A)$
  A olayının olmama olasılığı
  (Probability of not being occurred of event A)
- $P(A \cap B) = P(A) \cdot P(B)$
- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

1. Bir zar havaya atılıyor. Üst yüze gelen sayının 5 olma olasılığı kaçtır?
One dice is flipped up. What is the probability of getting the number 5 on the surface?

$\frac{1}{6}$

2. Bir zar havaya atılıyor. Üst yüze gelen sayının 3'ten büyük olma olasılığı kaçtır?
One dice is flipped up. What is the probability of getting a number bigger than 3 on the surface?

$\frac{1}{2}$

3. Bir madeni para art arda iki kez atılıyor. Art arda yazı gelme olasılığı kaçtır?
One coin is flipped up twice consecutively. What is the probability of getting tail in both of them?

$\frac{1}{4}$

4. 4 kız ve 5 erkek arasından seçilen bir kişinin erkek olma olasılığı kaçtır?
What is the probability of selecting a boy from a group of 4 girls and 5 boys?

$\frac{5}{9}$

5. İki farklı zar birlikte havaya atılıyor. Üst yüze gelen sayıların toplamının 10 olma olasılığı kaçtır?
Two different dice are flipped up at the same time. What is the probability of getting numbers on the surface whose sum is 10?

$\frac{1}{12}$

1. Ayşe'nin 4 farklı yüzüğü ve 6 farklı kolyesi vardır. Ayşe 1 yüzük veya 1 kolyeyi kaç farklı şekilde seçebilir?

Ayşe has 4 different rings and 6 different neclaces. In how many different ways can Ayse select 1 ring and 1 neclace?

A) 4 B) 6 C) 8 D) 10 E) 24

2. Bir sınıfta 10 kız ve 8 erkek vardır. Bu sınıftan 1 kız veya 1 erkek öğrenci kaç farklı şekilde seçilebilir?

In a class there are 10 girls and 8 boys. In how many different ways can 1 girl and 1 boy be selected?

A) 14 B) 18 C) 22 D) 24 E) 80

3. Bir kutuda 12 farklı kırmızı kalem ve 6 farklı siyah kalem vardır. Bu kutudan 1 kırmızı veya 1 siyah kalem kaç farklı şekilde seçilebilir?

In a box there are 12 different red pencils and 6 differeent black pencils. In how many different ways can 1 red and 1 black pencil be selected?

A) 18 B) 36 C) 40 D) 52 E) 72

4. 8 farklı pantolonu ve 5 farklı gömleği olan bir kişi, 1 pantolon ve 1 gömleği kaç farklı şekilde giyebilir?

A person has 8 different trousers and 5 different shirts. In how many different ways can he wear 1 trouser and 1 shirt?

A) 13 B) 20 C) 40 D) 42 E) 52

5. 6 erkek, 10 kız öğrenci bulunan bir sınıftan 1 kız ve 1 erkek öğrenci kaç farklı şekilde seçilebilir?

In a class where there are 6 boys and 10 girls how many different ways can 1 girl and 1 boy be selected?

A) 16 B) 20 C) 40 D) 60 E) 80

6. Ece'nin 14 farklı eteği ve 6 farklı tişörtü vardır. Ece 1 eteği ve 1 tişörtü kaç farklı şekilde giyebilir?

Ece has 14 different skirts and 6 different t-shirts. In how many different ways can Elif wear 1 skirt and 1 t-shirt?

A) 20 B) 42 C) 80 D) 84 E) 96

7. A kentinden B kentine 6 farklı yol ve B kentinden C kentine 7 farklı yol vardır. Buna göre A kentinden C kentine kaç farklı yoldan gidilir?

There are 6 different roads from city A to city B and there are 7 different roads from city B to city C. According to this, in how many different ways can be gone from city A to city C?

A) 13 B) 26 C) 30 D) 36 E) 42

8. A kentinden B kentine 3 farklı yol ve B kentinden C kentine 5 farklı yol vardır. Buna göre A kentinden C kentine gidilen yolları dönüşte kullanmamak şartıyla kaç farklı yoldan gidip gelinebilir?

There are 3 different roads from city A to city B and there are 5 different roads from city B to city C. According to this in how many different ways can be gone from city A to city C providing that the same roads are not be used in return?

A) 100 B) 120 C) 145 D) 225 E) 248

9. {1, 2, 3, 4} kümesinin elemanları ile 3 basamaklı kaç farklı sayı yazılabilir?

How many different 3 digit numbers can be written by using the elements of set {1, 2, 3, 4}?

A) 24 B) 48 C) 64 D) 72 E) 80

10. {2, 4, 6, 8, 9} kümesinin elemanları ile rakamları farklı üç basamaklı kaç farklı sayı yazılabilir?

How many different 3 digit numbers can be written by using the elements of set {2, 4, 6, 8, 9} providing that the numbers are different from each other?

A) 27 B) 45 C) 60 D) 120 E) 125

11. {1, 2, 4, 6, 9} kümesinin elemanlarını kullanarak 4 basamaklı kaç çift doğal sayı yazılır?

How many different 4 digit numbers can be written by using the elements of set {1, 2, 4, 6, 9} providing that the numbers are even natural numbers?

A) 120 B) 225 C) 375 D) 500 E) 625

12. {1, 3, 5, 6, 8} kümesinin elemanları kullanılarak üç basamaklı kaç farklı tek doğal sayı yazılır?

How many different 4 digit numbers can be written by using the elements of set {1, 3, 5, 6, 8} providing that the numbers are odd natural numbers?

A) 36 B) 75 C) 90 D) 95 E) 125

13. {1, 2, 3, 4, 5, 6, 7} kümesinin elemanlarını kullanarak üç basamaklı rakamları farklı kaç çift doğal sayı yazılır?

How many 3 – digit numbers can be written from the elements of the set {1, 2, 3, 4, 5, 6, 7}. If no refaatation.

A) 90 B) 108 C) 120 D) 150 E) 216

14. {1, 6, 4, 8, 9, 7, 5} kümesinin elemanlarını kullanarak 4 basamaklı rakamları farklı kaç tek doğal sayı yazılır?

How many different 4 digit numbers can be written by using the elements of set {1, 6, 4, 8, 9, 7, 5} providing that the numbers are odd natural numbers and different from each other?

A) 440 B) 480 C) 560 D) 600 E) 625

15. {1, 2, 3, 4, 5} kümesinin elemanları kullanılarak rakamları farklı üç basamaklı 300 den küçük kaç doğal sayı yazılır?

How many different 3 digit numbers can be written by using the elements of set {1, 2, 3, 4, 5} providing that the number is smaller than 300?

A) 18 B) 24 C) 36 D) 45 E) 75

16. {0, 2, 4, 5, 8, 9} kümesinin elemanları kullanılarak üç basamaklı, rakamları farklı kaç çift doğal sayı yazılır?

How many different 3 digit numbers can be written by using the elements of set {0, 2, 4, 5, 8, 9} providing that the numbers are even natural numbers and different from each other?

A) 68 B) 60 C) 56 D) 54 E) 52

1. 3 kız ve 2 erkek düz bir sıraya kaç farklı biçimde oturabilir?

In how many different ways can 3 girls and 2 boys sit on a flat bench?

A) 12 B) 24 C) 48 D) 96 E) 120

2. Anne, baba ve 3 çoçuktan oluşan bir aile düz bir sıraya, anne ile baba yan yana olmak şartıyla kaç farklı şekilde oturabilir?

In how many different ways a family with a mother, a father and 3 children sit on a flat bench providing that the mother and the father sit side by side?

A) 24 B) 48 C) 64 D) 96 E) 120

3. 6 öğretmen yuvarlak bir masa etrafına kaç farklı biçimde oturabilir?

In how many different ways can 6 teachers sit around a round table?

A) 24 B) 120 C) 720 D) 824 E) 964

4. 4 kız ve 3 erkek düz bir sıraya erkekler yan yana olmak şartıyla kaç farklı biçimde oturabilir?

In how many different ways can 4 girls and 3 boys sit on a flat bench in such a way that boys will sit side by side?

A) 120 B) 360 C) 600 D) 720 E) 1440

5. 2 farklı matematik,3 farklı geometri, 5 farklı fizik kitabı bir rafa yan yana kaç farklı biçimde dizilebililir?

In how many different ways can 2 different maths books, 3 different geometry books, 5 different physics books be aligned side by side on a shelf?

A) 3! B) 2! · 3! · 5! C) 2! · 3! · 5! · 7! D) 10! E) 10! · 3!

6. 3 farklı kimya, 2 farklı fizik, 4 farklı matematik kitabı bir rafa aynı ders kitapları yan yana gelmek koşuluyla kaç farklı biçimde dizilebilir?

In how many different ways can 3 different chemistry books, 2 different physics books, 4 different maths books be aligned on a shelf in such a way that same genre of books will be side by side?

A) 3! · 2! · 4! B) 3! · 2! · 4! · 3! C) 9! · 2! D) 9! E) 9! · 3!

7. 4 doktor, 3 mühendis, 3 mimar bir yuvarlak masa etrafına, aynı meslekten olanlar yan yana olmak şartıyla kaç değişik şekilde oturabilir?

In how many different ways can 4 doctors, 3 engineers, 3 architects sit around a round table in such a way that people from the same proffesion will sit side by side?

A) 3! · 3! · 3! B) 2! · 4! · 3! · 3! C) 3! · 2! · 2! D) 9! E) 10!

8. 5 farklı anahtarın tamamı, bir halkaya kaç değişik biçimde takılabilir?

In how many different ways can all the 5 different keys be put around the key chain?

A) 12 B) 24 C) 36 D) 60 E) 120

9. 4 öğrenci yan yana duran 5 sıraya kaç farklı biçimde oturabilir?

In how many different ways can 4 students sit on a 5 different bench which stay side by side?

A) 12 B) 24 C) 48 D) 96 E) 120

10. 3 kişi 5 farklı şehre kaç farklı şekilde gidebilir?

In how many different ways can 3 people go to 5 different cities?

A) 27 B) 30 C) 60 D) 120 E) 125

11. 3 farklı çikolata her çocuğa en fazla bir çikolata vermek koşuluyla 6 cocuğa kaç farklı biçimde verilebilir?

In how many differents ways can 3 bars of chocolate be distributed to 6 children in such a way that each child will take one chocolate at most?

A) 27 B) 60 C) 120 D) 216 E) 240

12. 4 kız ve 4 erkek düz bir sıraya, herhangi iki kız yan yana gelmemek koşuluyla kaç farklı biçimde oturabilirler?

In how many ways can 4 girls and 4 boys sit on a flat bench in such a way that girls will not sit side by side?

A) $5! \cdot 5!$ B) $4! \cdot 5!$ C) $4! \cdot 4!$ D) $4! \cdot 3!$ E) $4! \cdot 2!$

13. "TEKERLEK" kelimesindeki harfler kullanılarak sekiz harfli anlamlı veya anlamsız kaç farklı kelime yazılabilir?

In how many different ways can words with eight letters be arranged using the letter of the word 'TEKERLEK', it doesn't matter if they are meaningfull or meaningless?

A) $8!$ B) $\frac{8!}{2! \cdot 3!}$ C) $\frac{8!}{2!}$ D) $\frac{8!}{3!}$ E) $\frac{8!}{5!}$

14. 22333444 sayısının rakamları kullanılarak sekiz basamaklı kaç farklı sayı yazılabilir?

How many 8 digit numbers can be written by using the numbers of 22333444?

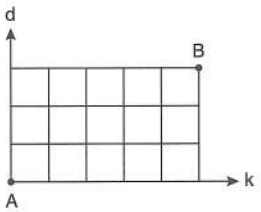
A) $\frac{8!}{3!}$ B) $\frac{8!}{2! \cdot 3! \cdot 3!}$ C) $\frac{8!}{5!}$ D) $\frac{8!}{3! \cdot 3!}$ E) $8!$

15. 30033355 sayısının rakamları kullanılarak sekiz basamaklı kaç farklı sayı yazılabilir?

How many 8 digit numbers can be written by using the numbers of 30033355?

A) 420 B) 315 C) 105 D) 75 E) 50

16.



A noktasından başlayarak k ve d yönünde ilerleyerek B noktasına kaç farklı biçimde gidilebilir?

In how many different ways can be gone starting from point A to point B in k and d direction?

A) 80 B) 75 C) 72 D) 60 E) 56

1. 6 elemanlı bir kümenin 3 elemanlı alt kümelerinin sayısı kaçtır?

What is the number of the subsets with 3 elements of the set with 6 elements?

A) 12 B) 20 C) 24 D) 60 E) 120

2. 7 elemanlı bir kümenin en çok 2 elemanlı alt kümelerinin sayısı kaçtır?

What is the number of the subsets maximum of 3 elements of the set with 7 elements?

A) 12 B) 15 C) 24 D) 29 E) 30

3. 10 farklı kalem arasından 4 kalem kaç farklı şekilde seçilebilir?

In how many different ways can 4 pencils be selected among 10 different pencils?

A) 120 B) 150 C) 165 D) 180 E) 210

4. 8 farklı çikolatanın 3'ü Ali'ye , 5'i Ayşe'ye kaç farklı şekilde verilebilir?

In how many different ways can 3 bars of chocolate to Ali, 5 bars of chocolate to Ayşe be given among 8 different bars of chocoloate?

A) 54 B) 56 C) 60 D) 72 E) 104

5. 12 kişilik bir gruptan 4 kişi Ankara'ya 8 kişi İstanbul'a gidecektir. Bu iki grup kaç değişik biçimde oluşturulur?

From a group of 12 people 4 people will go to Ankara, 8 people will go to İstanbul. In how many different ways can this two group be formed?

A) 495 B) 510 C) 540 D) 600 E) 720

6. 5 kız ve 4 erkek arasından 3 kişilik bir grup oluşturulacaktır. Grupta en az 1 tane kız bulunmak koşuluyla kaç farklı seçim yapılabilir?

Among 5 girls and 4 boys one group of 3 people will be formed. In how many different ways can this group be formed in such a way that there will be at lesat one girl?

A) 24 B) 36 C) 60 D) 72 E) 80

7. Ömer'in de aralarında bulunduğu 9 kişi arasından 4 kişi seçilecektir. Ömer'in de bulunduğu kaç değişik seçim yapılabilir?

There is a group of 9 people including Ömer. In how many different ways can 4 people be selected in such a way that Ömer also will be in?

A) 60 B) 56 C) 48 D) 32 E) 28

8. Özdeş olmayan 3 mavi ,4 kırmızı, 5 sarı bilye arasından 4 bilye seçilecektir. Her renkten en az bir bilye alma koşuluyla 4 bilye kaç farklı şekilde seçilebilir?

4 marble will be chosen among 3 blue, 4 red, 5 yellow marble which are not identical. In how many different ways can 4 marble be selected in such a way that there will be at least one marble in each color?

A) 270 B) 450 C) 480 D) 510 E) 540

9. Ece ile Esra'nın da aralarında bulunduğu 9 kişi arasından, Ece veya Esra'nın içinde bulunduğu 4 kişilik bir grup kaç değişik şekilde seçilebilir?

There is a group of 9 people including Ece and Esra. In how many different ways can a group of 4 people be formed in such a way that there will be Ece or Esra?

A) 78 B) 84 C) 86 D) 91 E) 95

10. Ceren ile Melih'in de aralarında bulunduğu 6 kişi arasından 3 kişilik bir ekip oluşturulacaktır. Bu grupların kaçında Ceren ile Melih birlikte bulunmaz?

There is a group of 6 people including Ceren and Melih. In how many different ways can a group of 3 people be formed in such a way that Melih and Ceren will not be there at the same time?

A) 10 B) 12 C) 16 D) 18 E) 20

11. Aynı 4 matematik kitabı her kişiye en fazla 1 kitap vermek koşuluyla 6 kişiye kaç değişik şekilde dağıtılabilir?

4 same maths book will be given to 6 students. In how many different ways can 6 students take the book in such a way that maximum of one book will be given to each student?

A) 9 B) 15 C) 24 D) 36 E) 40

12. {a, b, c, d, e, f} kümesinin 3 elemanlı alt kümelerinin kaçında "f" bulunur?

In how many of the subsets with 3 elements of set (a, b, c, d, e, f) will contain 'f'?

A) 8 B) 10 C) 12 D) 15 E) 18

13. 3 madeni 1 TL 4 farklı kumbaraya kaç farklı biçimde atılabilir?

In how many different ways can 3 similar coins be put in 4 different piggy bank?

A) 8 B) 12 C) 18 D) 20 E) 24

14. 4 farklı negatif sayı ile 3 farklı pozitif sayı arasından 3 sayı seçilecektir. Bu sayıların çarpımları pozitif olması koşuluyla kaç farklı seçim yapılabilir?

Among 4 different negative numbers and 3 different positive numbers 3 numbers will be selected. How many different ways can this selection be made in such a way that the multiplication of these numbers will be positive?

A) 18 B) 19 C) 24 D) 28 E) 36

15. 10 soruluk bir sınavda, en az 3 soru cevaplayacak olan bir öğrenci kaç farklı seçim yapabilir?

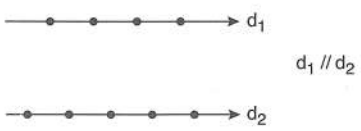
In an exam with 10 questions how many different selection can a student make who will answer at least 3 questions?

A) $2^{10} - 2^7$ B) $2^{10} - 64$ C) $2^{10} - 56$ D) $2^{10} - 11$ E) $2^{10} - 1$

16. $\binom{10}{2}+\binom{10}{3}+\binom{10}{4}+\binom{10}{5}+\binom{10}{6}+\binom{10}{7}+\binom{10}{8}=?$

A) 2^{10} B) $2^{10} - 1$ C) $2^{10} - 11$ D) $2^{10} - 20$ E) $2^{10} - 22$

1.

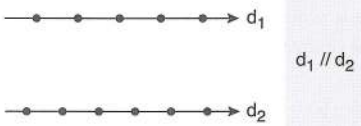


Şekilde verilen noktalar kaç doğru belirtir?

How many line will the points given on the figure define?

A) 14 B) 15 C) 16 D) 22 E) 36

2.

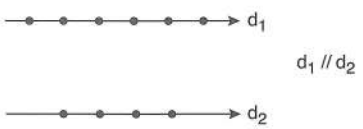


Şekilde verilen noktalar kaç üçgen belirtir?

How many ltriangle will the points given on the figure define?

A) 165 B) 135 C) 125 D) 110 E) 100

3.

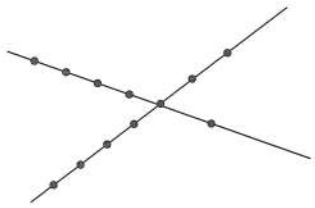


Şekilde verilen noktalar kaç dörtgen belirtir?

How many quadrilateral will the points given on the figure define?

A) 72 B) 75 C) 84 D) 86 E) 90

4.

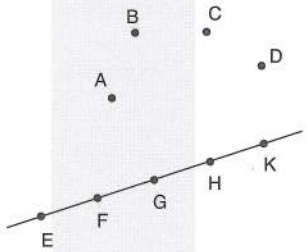


Şekilde verilen noktalar kaç doğru belirtir?

How many line will the points given on the figure define?

A) 28 B) 30 C) 32 D) 40 E) 45

5.

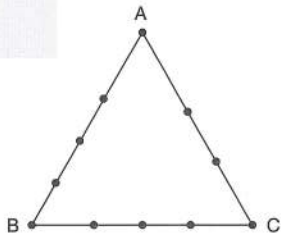


Şekilde verilen noktalara göre bir köşesi H olan kaç farklı üçgen çizilebilir?

With the points given on the figure how many different triangle can be drown whose one edge will be H?

A) 21 B) 22 C) 23 D) 24 E) 25

6.

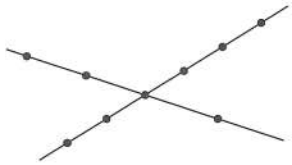


ABC üçgeninde verilen 11 farklı nokta kaç farklı doğru belirtir?

How many different line do 11 points given on ABC triangle indicate?

A) 23 B) 26 C) 29 D) 32 E) 39

7.

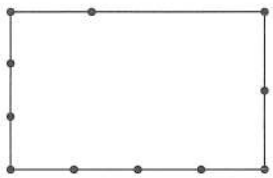


Şekilde verilen noktalar kaç üçgen belirtir?

How many ltriangle will the points given on the figure define?

A) 60 B) 58 C) 56 D) 54 E) 48

8.

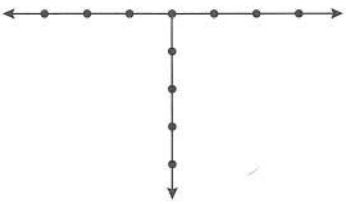


Şekilde verilen noktalar kaç üçgen belirtir?

How many ltriangle will the points given on the figure define?

A) 146 B) 148 C) 149 D) 150 E) 151

9.



Şekilde verilen noktalar kaç üçgen belirtir?

How many ltriangle will the points given on the figure define?

A) 100 B) 105 C) 110 D) 115 E) 120

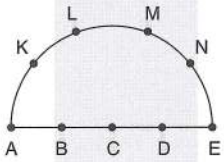
10.

Şekilde verilen noktalar kaç üçgen belirtir?

How many ltriangle will the points given on the figure define?

A) 400 B) 350 C) 266 D) 210 E) 105

11.

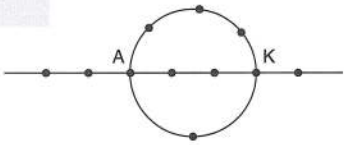


Şekilde verilen noktalara göre K veya C'den geçen kaç farklı doğru çizilebilir?

With the points given on the figure how many different line can be drown which passes through K or C?

A) 8 B) 9 C) 10 D) 11 E) 12

12.

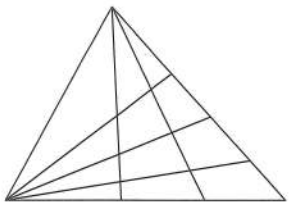


Şekilde verilen noktalara göre bir köşesi A veya K olan kaç farklı üçgen çizilebilir?

With the points given on the figure how many different triangle can be drown which passes through A or K?

A) 30 B) 36 C) 44 D) 56 E) 60

1.

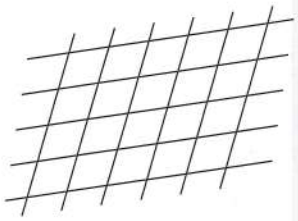


Şekilde kaç farklı üçgen vardır?

How many different triangle are there on the figure?

A) 39 B) 40 C) 41 D) 42 E) 43

2.

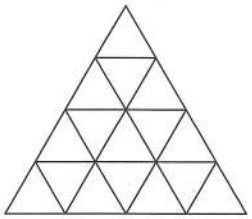


Şekilde kaç farklı paralelkenar vardır?

How many different parallelogram are there on the figure?

A) 180 B) 150 C) 120 D) 100 E) 80

3.

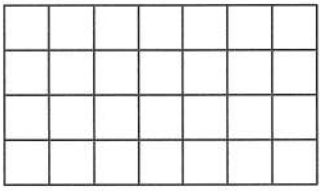


Şekilde kaç farklı üçgen vardır?

How many different triangle are there on the figure?

A) 24 B) 25 C) 26 D) 27 E) 28

4.

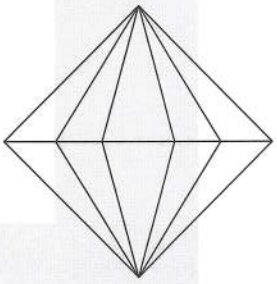


Şekil eş karelerden oluşmuştur. Şekilde kaç farklı kare vardır?

Figure is made up of identical squares. How many different squares are there on the figure?

A) 54 B) 56 C) 58 D) 60 E) 62

5.

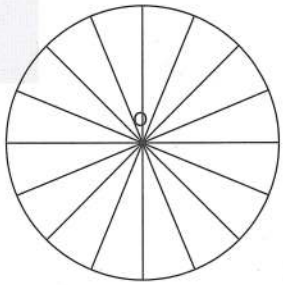


Şekilde kaç farklı üçgen vardır?

How many different triangle are there on the figure?

A) 24 B) 25 C) 28 D) 30 E) 32

6.



O merkezli dairede kaç farklı daire dilimi vardır?

How many sectors are there in given circle with center O?

A) 120 B) 160 C) 180 D) 200 E) 240

7. 10 farklı doğru en fazla kaç noktada kesişir?

What is the maximum number of points of intersection of 10 distinct Lines in a plane?

A) 40 B) 42 C) 45 D) 48 E) 56

8. 3 birbirine paralel toplam 7 farklı doğru, en fazla kaç noktada kesişir?

What is the maximum number of points of intersection of 7 distinct lines - when 3 of them are parallel to each other?

A) 19 B) 18 C) 17 D) 16 E) 15

9. Aynı kenara sahip olmayan 4 farklı dörtgen en fazla kaç farklı noktada kesişir?

4 different quadrilateral that do not have the same edge, how many points they intersect at most?

A) 36 B) 38 C) 40 D) 44 E) 48

10. Aynı kenara sahip olmayan 5 farklı üçgen, en fazla kaç farklı noktada kesişir?

5 different triangles that do not have the same edge. How many points do they intersect at most?

A) 28 B) 30 C) 48 D) 54 E) 60

11. Yarıçapları farklı 6 çember en fazla kaç farklı noktada kesişir?

What is the maximum number of points of intersection of 6 different circles?

A) 32 B) 30 C) 29 D) 24 E) 12

12. 7 farklı elips, en fazla kaç farklı noktada kesişir?

What is the maximum number of points of intersection of 7 different ellipses?

A) 42 B) 63 D) 72 D) 84 E) 90

1. $(3x - y)^5$ ifadesinin açılımındaki katsayılar toplamı kaçtır?
What is the sum of expansion of factors of $(3x - y)^5$ expression?

A) 1 B) 32 C) 64 D) 124 E) 243

2. $(4x - 2)^4$ ifadesinin sabit terimi kaçtır?
What is the constant term of $(4x - 2)^4$ expression?

A) 8 B) 12 C) 14 D) 16 E) 24

3. $n, k \in R$
$(2x^2 + y)^8 = ... + k \cdot x^4 \cdot y^n + ...$
$\Rightarrow n + k = ?$

A) 105 B) 110 C) 118 D) 120 E) 124

4. $n, k \in R$
$(3x - y^2)^7 = ... + k \cdot x^3 \cdot y^n + ...$
$\Rightarrow n + k = ?$

A) 627 B) 720 C) 840 D) 950 E) 953

5. $n, k \in R$
$(2x^3 - y)^{10} = ... + k \cdot x^n \cdot y^7 + ...$
$\Rightarrow n + k = ?$

A) – 857 B) – 864 C) – 900 D) – 951 E) – 962

6. $\left(x + \frac{1}{x}\right)^{12}$ ifadesinin sabit terimi kaçtır?
What is the constant term of the expression?

A) $\binom{12}{7}$ B) $\binom{12}{6}$ C) $\binom{12}{4}$ D) $\binom{12}{3}$ E) $\binom{12}{2}$

7. $\left(2x^3 - \frac{1}{x}\right)^8$ ifadesinin sabit terimi kaçtır?
What is the constant term of the expression?

A) 92 B) 108 C) 112 D) 120 E) 132

8. $\left(x^2 - \frac{2}{x^3}\right)^5$ ifadesinin sabit terimi kaçtır?
What is the constant term of the expression?

A) 40 B) 38 C) 36 D) 34 E) 32

9. $\left(x^3+\frac{1}{\sqrt{x}}\right)^{14}$ ifadesinin sabit terimi kaçtır?

What is the constant term of the expression?

A) 88 B) 89 C) 90 D) 91 E) 92

10. $\left(\frac{x}{2}-\frac{1}{x}\right)^6$ ifadesinin açılımındaki x^2 li terimin katsayısı kaçtır?

What is the expansion coefficient of x^2?

A) $\frac{3}{4}$ B) $\frac{15}{16}$ C) 1 D) $\frac{16}{15}$ E) $\frac{7}{5}$

11. $(2x - y)^8$ ifadesinin açılımı x'in azalan kuvvetine göre dizildiğinde baştan 3. terim nedir?

If the expansion of expression $(2x - y)^8$ is sequenced by x's lowering powers what is the 3rd term from the begining

A) $112 \cdot x^2y^6$ B) $100 \cdot x^2y^6$ C) $120 \cdot x^3y^5$ D) $28 \cdot 2^5 \cdot x^3y^5$ E) $28 \cdot 2^6 \cdot x^6y^2$

12. $(3x - 1)^7$ ifadesinin açılımı x'in azalan kuvvetine göre dizildiğinde baştan 4. terimi nedir?

If the expansion of expression $(3x - 1)^7$ is sequenced by x's lowering powers what is the 4th term from the begining?

A) $720 \cdot x^3$ B) $800 \cdot x^2$ C) $-35 \cdot 81 \cdot x^4$ D) $35 \cdot 27 \cdot x^4$ E) $950 \cdot x^4$

13. $(x - 3y)^6$ ifadesinin açılımı x'in azalan kuvvetine göre dizildiğinde sondan 2. terim nedir?

If the expansion of expression $(x - 3y)^6$ is sequenced by x's lowering powers what is the second term from the end

A) $18 \cdot yx^5$ B) $12 \cdot xy^5$ C) $6 \cdot 3^5 \cdot yx^5$ D) $-6 \cdot 3^5 \cdot y^5x$ E) $24 \cdot x^2y^4$

14. $(x^2 - 3y)^6$ ifadesinin açılımı x'in azalan kuvvetine göre dizildiğinde ortadaki terim nedir?

If the expansion $(x^2 - 3y)^6$ is seexqpurensscieodn by x's lowering powers what is the middle term from the end

A) $-240 \cdot x^6y^3$ B) $320 \cdot x^3y^6$ C) $500 \cdot x^4y^5$ D) $-540 \cdot x^6y^3$ E) $-600 \cdot x^6y^3$

15. $\left(\sqrt[3]{2}+\sqrt{3}\right)^5$ ifadesinin açılımındaki rasyonel sayı kaçtır?

$\left(\sqrt[3]{2}+\sqrt{3}\right)^5$ *What is the expansion rational number of this expression?*

A) 30 B) 42 C) 52 D) 54 E) 60

16. $k, n \in R$

$(x + y - z)^{10} = ... + k \cdot x^4 \cdot y^3 \cdot z^n + ...$

$\Rightarrow k = ?$

A) $-\binom{10}{4}\cdot\binom{6}{2}$ B) $\binom{10}{3}\cdot\binom{4}{2}$ C) $\binom{10}{3}\cdot\binom{6}{4}$ D) $-\binom{10}{2}\cdot\binom{6}{2}$ E) $-\binom{10}{6}\cdot\binom{6}{3}$

1. 2 madeni para atıldığında en az bir tura gelme olasılığı kaçtır?

When 2 coins thrown , what is the possibility of at least one is round?

A) $\frac{1}{8}$ B) $\frac{1}{4}$ C) $\frac{1}{2}$ D) $\frac{3}{4}$ E) 1

2. Bir madeni para art arda 4 kez atıldığında, ikisinin yazı, ikisinin tura gelme olasılığı kaçtır?

When a coin is thrown 4 times repeatedly , what is the possibility of 2 become letters and 2 become round?

A) $\frac{1}{4}$ B) $\frac{3}{8}$ C) $\frac{1}{2}$ D) $\frac{5}{8}$ E) $\frac{3}{4}$

3. İki zar atıldığında üst yüzlere gelen sayıların toplamının 6 olma olasılığı kaçtır?

When two laminas are thrown what is the possibility of their top sides sum become 6?

A) $\frac{1}{4}$ B) $\frac{2}{9}$ C) $\frac{7}{36}$ D) $\frac{1}{6}$ E) $\frac{5}{36}$

4. Bir torbada 3 mavi, 4 turuncu, 5 yeşil top vardır. Çekilen bir topun yeşil olma olasılığı kaçtır?

In a bag there are 3 blue, 4 orange, and 5 green balls. what is the possibility of the ball being green when we want to take one randomly?

A) $\frac{5}{12}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{6}$ E) $\frac{1}{12}$

5. Üç atın yarıştığı bir koşuda A atının kazanma olasılığı $\frac{1}{3}$, B atının kazanma olasılığı $\frac{2}{7}$ ise C atının kazanma olasılığı kaçtır?

3 horses are racing if the winning possibility of horse A $\frac{1}{3}$, horse B's 2 winning possibility is $\frac{2}{7}$ what is the possibility of winning of 7 horse C?

A) $\frac{3}{7}$ B) $\frac{8}{21}$ C) $\frac{1}{3}$ D) $\frac{2}{7}$ E) $\frac{5}{21}$

6. Bir torbada 6 sarı, 8 mavi bilye vardır. Çekilen iki bilyenin farklı renkte olma olasılığı kaçtır?

In a bag there are 6 yellow and 8 blue balls. what is the possibility of the ball being in different colors when we choose one randomly for 2 times?

A) $\frac{6}{13}$ B) $\frac{1}{2}$ C) $\frac{17}{91}$ D) $\frac{48}{91}$ E) $\frac{8}{15}$

7. Bir torbada 6 sarı, 8 mor bilye vardır. Art arda çekilen iki bilyeden ilkinin sarı, ikincisinin mor olma olasılığı kaçtır?

In a bag there are 6 yellow and 8 purple balls. what is the possibility of balls being, first yellow and second purple if we choose them sequential

A) $\frac{24}{91}$ B) $\frac{12}{91}$ C) $\frac{5}{13}$ D) $\frac{6}{13}$ E) $\frac{7}{13}$

8. 3 kız ve 5 erkeğin bulunduğu bir gruptan seçilen 2 kişiden en az birinin erkek olma olasılığı kaçtır?

3 in a group of 3 girls and 5 boys what is the possibility of 2 of them at least be a boy?

A) $\frac{11}{14}$ B) $\frac{25}{28}$ C) $\frac{6}{7}$ D) $\frac{5}{14}$ E) $\frac{3}{7}$

9. Bir madeni para 5 defa havaya atılıyor. Önce 2 defa yazı, sonra 3 defa tura gelme olasılığı kaçtır?

A coin thrown in the air for 5 times. What is the possibility of that first 2 times it become letter and for the remaining 3 times it become round?

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) $\frac{1}{16}$ E) $\frac{1}{32}$

10. Bir kutuda 3 mavi, 4 turuncu ve 5 yeşil top vardır. Kutudan rastgele alınan bir topun mavi veya turuncu gelme olasılığı kaçtır?

In a box there are 3 blue, 4 orange, and 5 green balls. if choose a ball randomly what is the possibility of a ball become either blue or orange?

A) $\frac{2}{3}$ B) $\frac{7}{12}$ C) $\frac{1}{2}$ D) $\frac{5}{12}$ E) $\frac{1}{3}$

11. Bir torbada 3 kırmızı, 4 sarı top vardır. Çekilen 3 topun da sarı olma olasılığı kaçtır?

In a bag there are 3 red and 4 yellow balls. if we choose 3 balls what is the possibility of all three balls being yellow?

A) $\frac{1}{5}$ B) $\frac{6}{35}$ C) $\frac{1}{7}$ D) $\frac{4}{35}$ E) $\frac{3}{35}$

12. 4 evli çiftin bulunduğu bir gruptan seçilen 2 kişinin karı koca olma olasılığı kaçtır?

4 in a group of 4 married couples , what is the possibility of 2 chosen persons being husband and wife?

A) $\frac{1}{7}$ B) $\frac{2}{7}$ C) $\frac{3}{7}$ D) $\frac{4}{7}$ E) $\frac{5}{7}$

13. Bir hedefi A'nın vurma olasılığı $\frac{2}{5}$ ve B'nin vurma olasılığı $\frac{2}{3}$ tür. İkisi de hedefe bir atış yaptığında en az birinin hedefi vurma olasılığı kaçtır?

A targets hit chance by "a" is $\frac{2}{5}$ and hit chance by B is $\frac{2}{3}$. what is the possibility of both of them hitting the target when they are fired at the same time?

A) $\frac{3}{5}$ B) $\frac{2}{3}$ C) $\frac{11}{15}$ D) $\frac{4}{5}$ E) $\frac{13}{15}$

14. Bir torbada 2 yeşil, 3 kırmızı bilye vardır. Çekilen iki bilyenin de aynı renkte olduğu bilindiğine göre, bilyelerin kırmızı renkli olma olasılığı kaçtır?

In a bag there are 2 green and 3 red balls. because its known that both of the chosen balls are in same color, what is the possibility of the balls being red?

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) $\frac{5}{8}$ E) $\frac{7}{8}$

15.

Şekildeki kutulardan biri seçilip içinden bir top çekiliyor. Çekilen topun yeşil olma olasılığı kaçtır?

From the figure above we chose one and take out a ball from it. what is the possibility of a ball being green?

A) $\frac{39}{70}$ B) $\frac{3}{7}$ C) $\frac{4}{7}$ D) $\frac{43}{70}$ E) $\frac{9}{14}$

16. Hileli bir madeni paranın yazı gelme olasılığı $\frac{2}{3}$ tür. İki kez art arda atılan paranın en az bir kez yazı gelme olasılığı kaçtır?

A tricky coins be on its letter side possibility is $\frac{2}{3}$. If we throw it 2 times in a sequence what is the possibility of at least the coin be on its letter sid?

A) $\frac{17}{18}$ B) $\frac{8}{9}$ C) $\frac{7}{9}$ D) $\frac{2}{3}$ E) $\frac{1}{3}$

PERMÜTASYON - KOMBİNASYON
BİNOM - OLASILIK

PERMUTATION - COMBINATION
BINOMIAL - PROBABILITY

YANIT ANAHTARI | ANSWER KEY

TEST 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	A	C	D	D	E	B	C	C	C	B	A	B	B	A

TEST 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E	B	B	D	D	B	B	A	E	E	C	B	B	B	B	E

TEST 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	E	B	A	E	B	E	D	C	B	B	D	B	C	E

TEST 4

1	2	3	4	5	6	7	8	9	10	11	12
D	B	E	C	B	D	A	C	E	C	E	D

TEST 5

1	2	3	4	5	6	7	8	9	10	11	12
D	B	D	D	D	E	C	B	E	E	B	D

TEST 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	C	E	D	B	C	A	D	B	E	C	D	D	E	E

TEST 7

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
D	B	E	A	B	D	A	B	E	B	D	A	D	C	D	B