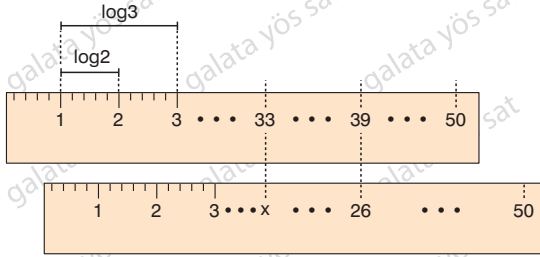


1. $\ln x + \ln y = 10$
 $\ln x - \ln y = 6$
 $\Rightarrow \log_y x = ?$

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

2.



$\Rightarrow x = ?$

- A) 19 B) 20 C) 21 D) 22 E) 23

3. I. $24 = 2 \cdot 3 \cdot 4 = e^{\ln 2} \cdot e^{\ln 3} \cdot e^{\ln 4}$
 II. $e^{\ln 2} \cdot e^{\ln 3} \cdot e^{\ln 4} = e^{\ln 2 + \ln 3 + \ln 4}$
 III. $e^{\ln 2 + \ln 3 + \ln 4} = e^{\ln 24}$
 IV. $e^{\ln 24} = e^{\ln(4 + 20)}$
 V. $e^{\ln(4 + 20)} = e^{\ln 4 + \ln 20}$
 VI. $e^{\ln 4 + \ln 20} = e^{\ln 4} \cdot e^{\ln 20}$
 VII. $e^{\ln 4} \cdot e^{\ln 20} = 4 \cdot 20 = 80$
 $\Rightarrow 24 = 80$

İlk hata hangi adımda yapılmıştır?

In which step the first mistake was made?

- A) III B) IV C) V D) VI E) VII

4. $\log_4 64! = a$
 $\Rightarrow \log_4 63! = ?$

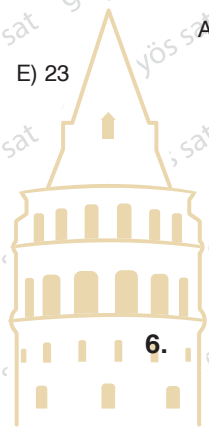
- A) $a - 3$ B) a C) $a + 3$
 D) $a + 4$ E) $a + 64$

5. $x^2 - 25x + 16 = 0$

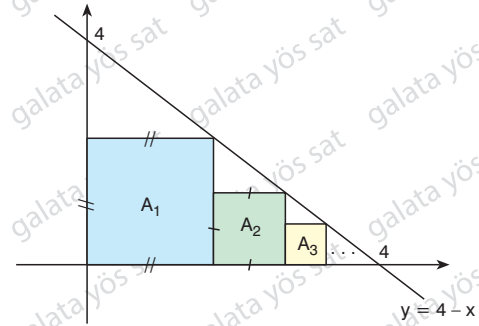
$f(x_1) = f(x_2) = 0$

$\Rightarrow \sqrt{6 + \sqrt{\frac{x_1}{x_2}}} + \sqrt{\frac{x_2}{x_1}} = ?$

- A) $\frac{25}{4}$ B) $\frac{15}{4}$ C) $\frac{15}{2}$ D) 3,5 E) 2,5



6.



• $A_1, A_2, A_3, \dots, A_k$ kare (square)

• $\sum_{n=1}^{\infty} A(A_n) = \frac{a}{b}$

$\Rightarrow a + b = ?$

- A) 23 B) 19 C) 18 D) 17 E) 16

1. 10 farklı kurşun kalem ile 3 farklı tükenmez kalem içerisinde 1 kurşun kalem veya 1 tükenmez kalem kaç farklı şekilde seçilebilir?

How many different ways can 1 pencil or 1 ballpoint pen be selected from 10 different pencils and 3 different ballpoint pens?

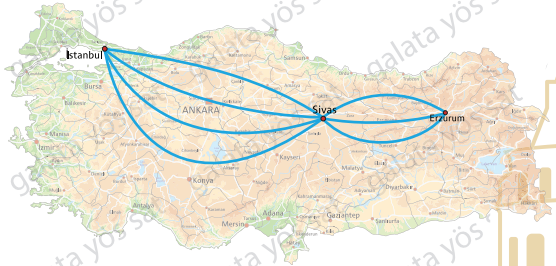
- A) 30 B) 20 C) 13 D) 11 E) 2

2. 4 farklı kalem ile 6 farklı defter arasından 1 kalem ve 1 defter kaç farklı şekilde seçilebilir?

How many different ways can 1 pen and 1 notebook be selected among 6 different notebooks with 4 different pens?

- A) 24 B) 20 C) 12 D) 10 E) 2

- 3.



İstanbul'dan Sivas'a 4 farklı yoldan; Sivas'tan Erzurum'a 3 farklı yoldan gidilebilmektedir.

Sivas'a uğramak şartıyla İstanbul'dan Erzurum'a kaç farklı yoldan gidilebilir?

From Istanbul to Sivas in 4 different ways; There are 3 different routes from Sivas to Erzurum.

How many different ways can you go from Istanbul to Erzurum, provided that you visit Sivas?

- A) 7 B) 10 C) 11 D) 12 E) 14

4. 4 farklı kitap yan yana kaç farklı şekilde sıralanabilir?

How many different ways can 4 different books be lined up side by side?

- A) 4 B) 3! C) 4! D) 5! E) 6!

5. $A = \{Z, A, F, E, R\}$

kümesinin harfleriyle harfleri farklı, 3 harfli anlamlı ya da anlamsız kaç farklı şekilde yazılabilir?

How many different 3-letter meaningful or meaningless ways can be written with the letters of the set?

- A) 20 B) 25 C) 30 D) 45 E) 60

- 6.

$$n = \frac{n!}{(n+2)!}$$

$$\Rightarrow 10 : 9 = ?$$

- A) $\frac{5}{6}$ B) $\frac{4}{3}$ C) $\frac{9}{10}$ D) $\frac{5}{4}$ E) $\frac{6}{5}$

7. 9, 8, 7, 6 rakamları ile rakamları farklı üç basamaklı kaç farklı doğal sayı yazılabilir?

How many different three-digit natural numbers with 9, 8, 7, 6 numbers and different numbers can be written?

- A) 48 B) 24 C) 12 D) 8 E) 6

- 8.

$$A = P(6, 2)$$

$$B = P(5, 3)$$

$$C = P(3, 2)$$

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

- A) 10 B) 15 C) 16 D) 18 E) 25

1. (a_n) bir aritmetik dizi (arithmetical sequence)

$$a_1^2 - a_7^2 = 48$$

$$a_4 = 4$$

$$\Rightarrow a_1 = ?$$

- A) 27 B) 17 C) 7 D) 6 E) 5

2. Ortak farkı 9 olan bir (a_n) aritmetik dizisinin a_1 , a_3 ve a_8 terimleri sırasıyla bir geometrik dizinin ardışık üç terimidir.

Buna göre, aritmetik dizinin 7. terimi kaçtır?

a_n arithmetic array which its common difference is 9, its a_1 , a_3 and a_8 respectively terms are geometric array's 3 terms, according to this; what is the 7th term of the arithmetic array?

- A) 63 B) 64 C) 65 D) 66 E) 67

3. $-(0,2) + (0,2)^2 - (0,2)^3 + \dots = ?$

- A) $-\frac{1}{6}$ B) $-\frac{1}{3}$ C) $-\frac{1}{2}$ D) -1 E) -2

4. $90^\circ < \alpha \leq 180^\circ$

$$\sum_{k=1}^{\infty} \sin^{2k} \alpha = \frac{1}{3}$$

$$\Rightarrow \alpha = ?$$

- A) 180° B) 150° C) 130° D) 120° E) 110°

5. Aritmetik bir dizi oluşturan üç sayının toplamı 6 dır. Eğer birinci sayıya 1, ikinci sayıya 2, üçüncü sayıya 5 eklenirse bir geometrik dizi oluşuyor.

Bu üç sayıdan en büyüğü kaç olabilir?

Sum of the 3 numbers which make an arithmetic array is 6, if we add 1 to its 1st, 2 to its 2nd and 5 to its 3rd number it will make a geometric array. What can be the biggest number among these 3 numbers?

- A) 8 B) 7 C) 3 D) 1 E) -3

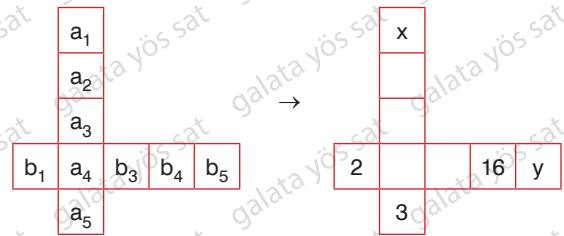
6. (a_n) bir aritmetik dizi (arithmetical sequence)

$$a_{n-3} + a_{n-2} + a_{n-1} = 6n + 3$$

$$\Rightarrow a_n = ?$$

- A) $2n - 5$ B) $2n - 3$ C) $2n - 1$
D) $2n + 3$ E) $2n + 5$

- 7.

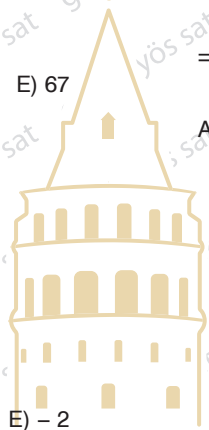


$$a_5 - a_4 = a_4 - a_3 = a_3 - a_2 = a_2 - a_1$$

$$\frac{b_5}{b_4} = \frac{b_4}{b_3} = \frac{b_3}{b_4} = \frac{a_4}{b_1}$$

$$\Rightarrow x + y = ?$$

- A) 35 B) 36 C) 37 D) 38 E) 39



1. $(a_n) = (-1)^n \cdot (n^2 + 2)$

$\Rightarrow a_2 + a_3 = ?$

- A) -5 B) -4 C) 0 D) 4 E) 5

2.

$$(a_n) = \begin{cases} n! + 4, & n = 2k + 1 \\ 13n, & n = 2k \end{cases}$$

$\Rightarrow a_{10} - a_3 = ?$

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

3.

$$(a_n) = \left(\frac{2n + 5}{n - 1} \right)$$

$a_k = 3$

$\Rightarrow k = ?$

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

4.

$$(a_n) = \left(\frac{3n - 4}{n} \right)$$

$a_k < \frac{5}{2}$

$\Rightarrow \sum k = ?$

- A) 14 B) 28 C) 34 D) 38 E) 40

5.

$$(a_n) = \left(\frac{n^2 + 6n - 91}{2n + 3} \right)$$

$a_k < 0$

$\Rightarrow \prod k = ?$

- A) 0 B) 0! C) 4! D) 6! E) 7!

6.

$$(a_n) = \left(\frac{2n^2 + 3n + 12}{n} \right)$$

$a_k \in \mathbb{Z}$

$\Rightarrow \sum k = ?$

- A) 28 B) 26 C) 24 D) 16 E) 12

7.

Aşağıdakilerden hangisi bir dizinin genel terimi **ola-**
maz?

Which of the following cannot be the general term of a sequence?

A) $\frac{3}{n+2}$ B) $\frac{2n}{2n-3}$ C) $\frac{3n^2+1}{2n+5}$

D) $\frac{7n}{n-5}$ E) $\frac{2n+1}{n+3}$

8.

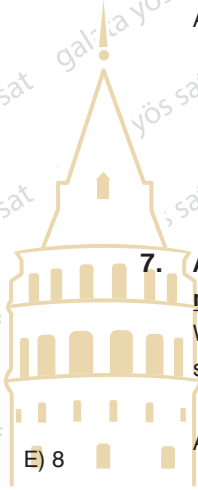
$\forall n > 1$

$a_1 = 12$

$a_{n+1} = a_n + n - 1$

$\Rightarrow a_5 = ?$

- A) 10 B) 12 C) 14 D) 18 E) 19



1. ABC bir üçgen

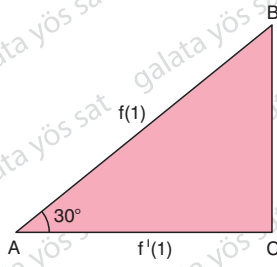
ABC is a triangle

$$m(\hat{A}) = 30^\circ$$

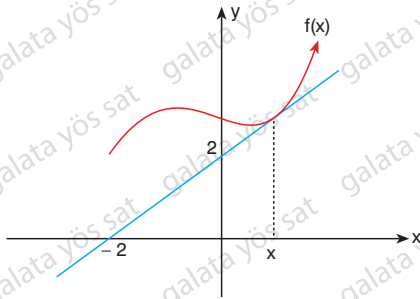
$$f(x) = 2x^3 - 5x + 7$$

$$\Rightarrow A(ABC) = ?$$

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



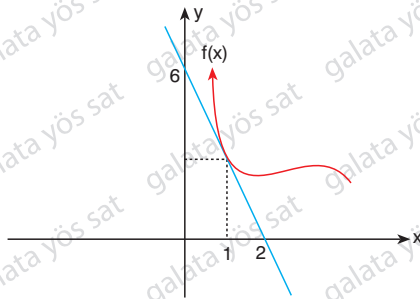
2.



$$\Rightarrow \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = ?$$

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

3.



$$\Rightarrow \lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x - 1} = ?$$

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

4.

$$f(x, m) = 2x^2 + 3m^2 + 4x + m$$

$$\Rightarrow \frac{d f(x, m)}{dx} - \frac{d f(x, m)}{dm} = ?$$

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

5.

$$f(x) = x^3 + mx^2 + nx + k$$

$$f(0) = 1$$

$$f'(0) = 2$$

$$f''(0) = -4$$

$$\Rightarrow f(3) = ?$$

- A) 17 B) 16 C) 15 D) 14 E) 13

6.

$$f(x) = \sin x + \cos x + e^x$$

$$\Rightarrow f'(x) - f(x) = ?$$

- A) $\sin 2x$ B) $-\sin 2x$ C) $2\cos x$
 D) $2\sin x$ E) $-2\sin x$

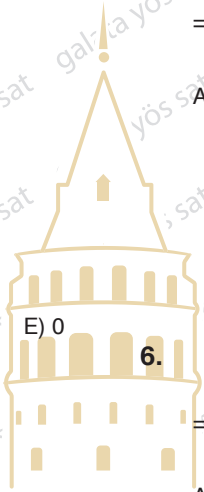
7.

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

$$f'(x) = bx^2 + 10x + c$$

$$\Rightarrow a + b + c = ?$$

- A) 5 B) 6 C) 7 D) 8 E) 9



9.

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

$$\Rightarrow \lim_{h \rightarrow 0} \frac{f(h + 2023) - f(2023)}{h} = ?$$

- A) 2023! B) 2023 C) 1 D) 0 E) -1

10.

$$f(x) = \ln x$$

$$\Rightarrow f'(x) = ?$$

- A) $x \ln x - x$ B) x C) $\frac{1}{x}$ D) $\frac{1}{\sqrt{x}}$ E) \sqrt{x}

11.

$$f(x) = e^{4x}$$

$$\Rightarrow \frac{f''(x)}{f'(x)} = ?$$

- A) 16 B) 4 C) e^{4x} D) $4e^x$ E) e^x

12.

$$g(x) = e^4 + 5x^2 + e^{2x}$$

$$\Rightarrow \lim_{h \rightarrow 0} \frac{g(h) - g(0)}{h} = ?$$

- A) 0 B) 5 C) 4 D) 2 E) 1

13.

$$f(x) = e^{3x}$$

$$f'''(x) = a \cdot e^{3x}$$

$$\Rightarrow a = ?$$

- A) 1 B) 2 C) 3 D) 9 E) 27

14.

$$f(x) = 5^{2x}$$

$$\Rightarrow f'(x) = ?$$

- A) $2 \cdot 5^{2x}$ B) $5^{2x} \cdot \ln 5$ C) $2 \cdot 5^{2x} \cdot \ln 5$
D) 0 E) $\ln 5$

15.

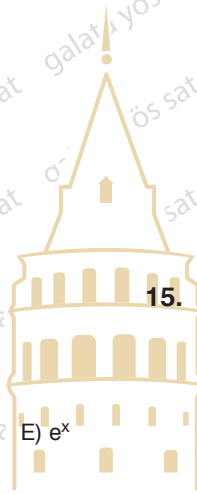
$$\frac{d^2(\cos x)}{dx^2} = ?$$

- A) $-\cos x$ B) $-\sin x$ C) $\tan x$
D) $\cos x$ E) $\sin x$

16.

$$\frac{d^3}{dx^3} (2023x^2 + \sin x) = ?$$

- A) $-\sin x$ B) $-\cos x$ C) 0
D) $4026 - \cos x$ E) $4026 - \sin x$

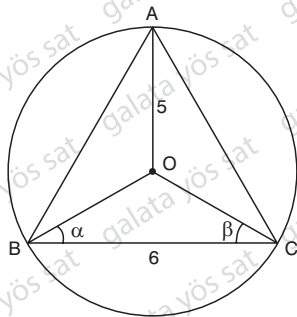


1. $\text{arc tan}2x = \text{arc cot}4x$

$\Rightarrow \prod x = ?$

- A) $-\frac{1}{8}$ B) $-\frac{1}{4}$ C) $-\frac{1}{2}$ D) $\frac{1}{2}$ E) $\frac{1}{8}$

2.

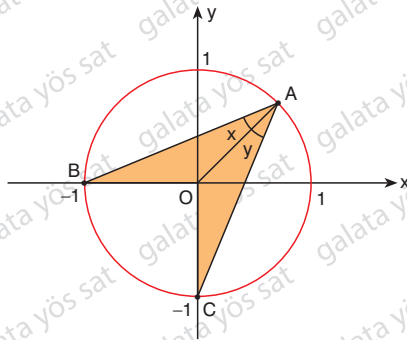


$|OA| = 5 \text{ br}$ $|BC| = 6 \text{ br}$

$\Rightarrow \tan\alpha - \cot\beta = ?$

- A) $\frac{5}{12}$ B) $\frac{1}{2}$ C) $\frac{7}{12}$ D) $\frac{2}{3}$ E) $\frac{3}{4}$

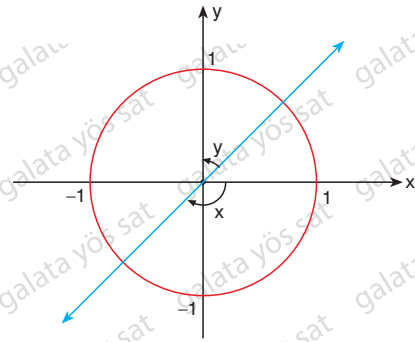
3.



$\Rightarrow A(\text{ABOC}) = ?$

- A) $\sqrt{2} \sin(x - y)$ B) $\sqrt{2} \sin(x + y)$
 C) $\frac{\sqrt{2}}{2} \cos(x + y)$ D) $\frac{\sqrt{2}}{2} \cos(x - y)$
 E) 1

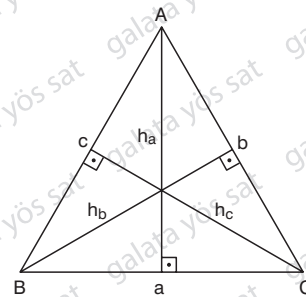
4.



$\Rightarrow \cos(\pi - x) - \sin y = ?$

- A) $2\sin x$ B) $\sin x$ C) 0 D) $2\cos x$ E) $\cos y$

5.

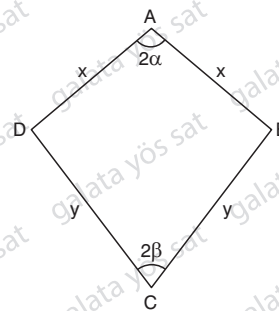


$6h_a = 5h_b = 3h_c$

$\Rightarrow \cos \hat{A} = ?$

- A) $-\frac{5}{3}$ B) -2 C) -1 D) $-\frac{1}{3}$ E) $-\frac{1}{15}$

6.



$|AB| = |AD| = x$

$|BC| = |CD| = y$

$m(\hat{A}) = 2\alpha$

$m(\hat{C}) = 2\beta$

$\Rightarrow \frac{x}{y} = ?$

- A) $\frac{\sin\beta}{\sin\alpha}$ B) $\frac{\cos\beta}{\cos\alpha}$ C) $\frac{\sin\alpha}{\sin\beta}$
 D) $\frac{\cos\alpha}{\cos\beta}$ E) 1

1. $k \in \mathbb{Z}$,

$$3670^\circ = 2\pi \cdot k + \alpha$$

$$\Rightarrow \alpha = ?$$

- A) 20° B) 30° C) 70° D) 80° E) 90°

2. $k \in \mathbb{Z}$,

$$-710^\circ = 2\pi \cdot k + \alpha$$

$$\Rightarrow \alpha = ?$$

- A) 10° B) 20° C) 30° D) 40° E) 50°

3. $k \in \mathbb{Z}$,

$$\frac{192\pi}{5} = 2\pi \cdot k + \alpha$$

$$\Rightarrow \alpha = ?$$

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

4.

$$\sin 2\alpha = x - 3$$

$$\Rightarrow ? < x < ?$$

- A) $-1 \leq x \leq 1$ B) $2 \leq x \leq 4$
 C) $-1 < x < 1$ D) $2 < x < 4$
 E) $3 \leq x \leq 4$

5.

$$\sin^2 \alpha + \cos^2 18^\circ = 1$$

$$\Rightarrow \alpha = ?$$

- A) 72° B) 68° C) 62° D) 18° E) 12°

6.

$$\frac{6 \cdot \sin^2 5^\circ + 6 \cdot \cos^2 5^\circ}{3 \cdot \tan 10^\circ \cdot \cot 10^\circ} = ?$$

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

7.

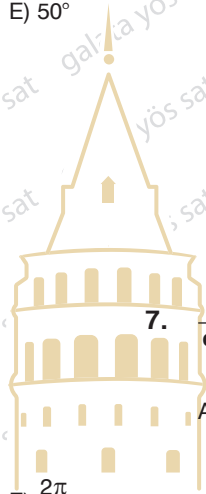
$$\frac{\sin 40^\circ}{\cos 50^\circ} - \tan 40^\circ \cdot \tan 50^\circ = ?$$

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

8.

$$\sin^2 70^\circ + \sin^2 20^\circ = ?$$

- A) 20 B) 10 C) 2 D) 1 E) 0



1. $3x^3 - 2x^2 + x + 1 \equiv P(x) \pmod{(x^2 + 1)}$

$\Rightarrow P(x) = ?$

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

2. $\text{der}[P(x)] = 5$

$\text{der}[Q(x)] = 7$

$\Rightarrow \text{der}[x^2 \cdot P(x) + x \cdot Q(x^2)] = ?$

- A) 14 B) 15 C) 16 D) 17 E) 18

3. $\forall x \in \mathbb{R}$

$3x - 5 = a(x^2 - 1) + bx(x - 1) - c(x + 1)$

$\Rightarrow a + b + c = ?$

- A) 1 B) 3 C) 4 D) 5 E) 7

4.
$$\begin{array}{r} P(x) \mid x^9 - x + 1 \\ \hline B(x) \\ \hline K(x) \end{array}$$

$\text{der}[B(x)] = \text{der}[K(x)] - 1$

$\Rightarrow \max[\text{der}(P(x))] = ?$

- A) 24 B) 23 C) 17 D) 16 E) 15

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

$\Rightarrow P(x^2) = ?$

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

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

$\Rightarrow P(20) = ?$

- A) 60 B) 61 C) 62 D) 63 E) 65

7. $(x^2 - 1) \cdot Q(x + 1) = x^3 + mx + n$

$$\begin{array}{r} x^2 - 1 \mid Q(x) \\ \hline B(x) \end{array}$$

$\Rightarrow B(x) = ?$

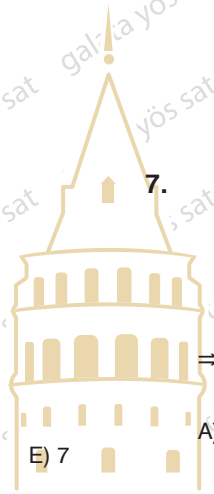
- A) x B) x + 1 C) x - 1
 D) x + 2 E) x - 2

8. $P(x) = (x + 2)^{2020} - 2(x + 2)^{2019}$

$$\begin{array}{r} P(x) \mid x \\ \hline B(x) \\ \hline B(2x + 5) \mid 2x - 2 \\ \hline K \end{array}$$

$\Rightarrow K = ?$

- A) 7^{2020} B) 7^{2019} C) 5^{2019}
 D) 9^{2019} E) 3^{2019}



1. Aşağıdakilerden hangisi polinomdur?

- A) $5x^2 + 1$ B) $\frac{1}{x} + 1$ C) $\sqrt{x} + 3$
 D) $x - \frac{2}{x}$ E) $\sqrt[5]{x} + 6$

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

$\Rightarrow \text{der}[P(x)] = ?$

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

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

polinomunun sabit terimi kaçtır?

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

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

polinomunun katsayılar toplamı kaçtır?

- A) 15 B) 7 C) 6 D) 5 E) 4

5. $P(x) = (a - b)x^4 + 13x - 4$

$Q(x) = 7x^4 + (a + b)x - 4$

$P(x) = Q(x)$

$\Rightarrow a^2 - b^2 = ?$

- A) 51 B) 71 C) 91 D) 101 E) 111

6. $P(x^2) = 3x^{10} + x^8 - x^2 + 5$

$\Rightarrow \text{der}[x^3 \cdot P(x)] = ?$

- A) 13 B) 11 C) 9 D) 8 E) 7

7. $(x^2 + 4x + 1) \cdot (x^2 + 3x - 5)$

açılımında x^3 lü terimin katsayısı kaçtır?

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

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

$Q(x) = x^2 - 4x + 4$

$\Rightarrow 2P(x) - Q(x) = ?$

- A) $4x^2 + 6x + 8$ B) $5x^2 + 2x + 12$
 C) $3x^2 + 10x + 4$ D) $3x^2 - x$
 E) $3x^2 - 7x$

