MATEMATIKA

2012 YIL 1-VARIANT

Testlar va ularning ishlanishi

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2012 yil 1-variant

2012-1v-1

$f(x) = -6x^2 + 2x - 1$ funksiyaning grafigi koordinatalar tekisligining qaysi choraklarida joylashgan?

A) III, IV C) I, II, III

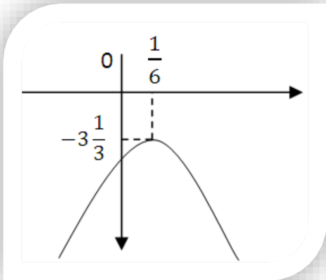
B) I, II D) II, IV

Yechish: Funksiyaning grafigi paraboladan iborat. Parabola uchlarini hisoblaymiz:

$$x_0 = -\frac{b}{2a} = -\frac{2}{2\cdot(-6)} = \frac{1}{6};$$

$$y_0 = \frac{4ac-b^2}{a} = \frac{4\cdot(-6)\cdot(-1)-2^2}{-6} = \frac{20}{-6} = -3\frac{1}{3};$$

Bosh koeffisent 0 dan kichikligi uchun parabola shoxchalari pastga qaragan bo'ladi:



Grafikdan ko'rinib turibdi, III va IV choraklardan grafik o'tadi. **Javob: A**

2012-1v-2

Agar M(3;3), N(1;4) va K(1;4) bo'lsa, MNK uchburchakning eng katta burchagini toping.

A) 90° B) 75° C) 135° D) 120°

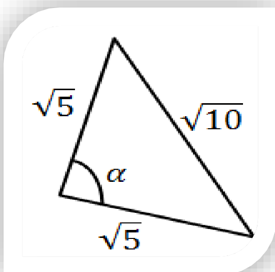
Yechish: Uchburchak tomonlarining uzunliklarini topib olamiz:

|MN|=$\sqrt{(3-4)^2+(3-5)^2} = \sqrt{5}$;

|NK|=$\sqrt{(4-1)^2+(5-4)^2} = \sqrt{10}$;

|MK|=$\sqrt{(3-1)^2+(3-4)^2} = \sqrt{5}$;

NK tomon uchburchakning eng katta tomoni ekanligi ma'lum bo'ldi. Bundan NK tomon qarshisidagi burchak eng katta burchak bo'lishi kelib chiqadi.



Kosinuslar teoremasiga ko'ra $(\sqrt{10})^2 = (\sqrt{5})^2 + (\sqrt{5})^2 - 2\sqrt{5}\sqrt{5}cos\alpha$;

$10 = 5 + 5 - 10cos\alpha$;

Bundan esa $cos\alpha = 0$ ekanligi kelib chiqadi. Demak $\alpha = \arccos(0) = 90^\circ$. **Javob: A.**

2012-1v-3

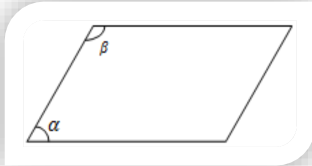
Parallelogramm burchaklaridan ikkitasining ayirmasi 30° ga teng. Shu burchaklarni toping.

A) 75°; 105° C) 55°; 125°

B) 65°; 135° D) 45°; 115°

Yechish:

Parallelogramm burchaklari xossasiga ko'ra:



$\alpha + \beta = 180^\circ$

tenglik o'rinli bo'ladi. Bundan

$$\begin{cases} \alpha + \beta = 180^\circ \\ \beta - \alpha = 30^\circ \end{cases};$$

$2\beta = 210^\circ$; $\beta = 105^\circ$;

$\alpha = 180^\circ - \beta = 75^\circ$; **Javob: A.**

2012-1v-4

Barcha nuqtalarining koordinatalari $x^2+y^2 \le 8x+16y$ tengsizlikni qanoatlantiradigan tekis figuraning yuzini toping.

A) 89π B) 80π C) 64π D) 100π

Yechish: Tengsizlikni aylananing tenglamasi ko'rinishiga o'xshatishga xarakat qilamiz:

$x^2+y^2=8x+16y$;

$x^2-8x+y^2-16y=0$;

$x^2-8x+16+y^2-16y+64=80$;

$(x-4)^2+(y-8)^2=(\sqrt{80})^2$.

Xosil bo'lgan tenglama radiusi $\sqrt{80}$ ga teng bo'lgan aylananing tenglamasidir. Xuddi shu chiziq bilan chegaralangan figuraning ya'ni doiraning yuzini topish kerak:

S=$\pi R^2 = \pi(\sqrt{80})^2 = 80\pi$. **Javob: B.**

2012-1v-5

Quyidagi sonlarning eng kattasini toping.

A) *sin170°* C) *sin20°*

B) *sin(-30°)* D) *sin100°*

Yechish: Barcha sonlardagi burchaklarni [0; $\frac{\pi}{2}$] oraliqga o'tkazamiz:

sin170°=sin(180°-170°)=sin10°;

sin(-30°)=-sin30°;

sin20°;

sin100°=sin(180°-100°)=sin80°;

$y = sinx$funksiya [0;$\frac{\pi}{2}$] oraliqda o'suvchi bo'lgani uchun eng katta 80° (misolda 100°) li burchakda eng katta qiymatga ega bo'ladi. **Javob: D.**

2012-1v-6

Berilgan uchta sonning uchinchisi birinchisiga 18,48:15,4 nisbatda bo'lib, ikkinchisining 40% ini tashkil etadi. Birinchi va ikkinchi sonning yig'indisi 400 ga teng. Birinchi sonni toping.

A) 120 B) 100 C) 520 D) 300

Yechish: No'malum sonlarni x,y,z deb olaylik. U xolda

$$\begin{cases} \frac{z}{x} = \frac{18,48}{15,4} \\ z = y \cdot 0,4 \\ x + y = 400 \end{cases} \Rightarrow \begin{cases} \frac{y \cdot 0,4}{x} = \frac{18,48}{15,4} \\ x + y = 400 \end{cases} \Rightarrow$$

$$\begin{cases} 0{,}4\cdot15{,}4y = 18{,}48x \\ x = 400 - y \end{cases} \Rightarrow$$

$6{,}16y = 18{,}48(400 - y);$
$y = 1200 - 3y;\ 4y = 1200;\ y = 300;$
$x = 400 - y = 400 - 300 = 100.$ **Javob: B.**

2012-1v-7

To'g'ri to'rtburchakning bir tomoni kvadratning tomonidan 8 sm kichik, ikkinchi tomoni esa kvadrat tomonidan 2 marta uzun. Agar to'g'ri to'rtburchak va kvadrat yuzlari teng bo'lsa, to'g'ri to'rtburchak perimetrini toping.

A) 80 B) 84 C) 60 D) 40

Yechish: Kvadratning tomoni a, to'g'ri to'rtburchakning tomonlari x va y bo'lsin. U holda

$$\begin{cases} x = a - 8 \\ y = 2a \\ xy = a^2 \end{cases};$$

x va y ni 3 – tenglikga qo'yamiz:

$(a-8)\cdot 2a = a^2;\ \ 2a^2 - 16a = a^2;$
$a^2 - 16a = 0;\qquad a(a-16) = 0;$
$a = 16$ javobni qabul qilamiz. Endi x va y ning qiymatini topamiz:
$x = a - 8 = 16 - 8 = 8\,;$
$y = 2a = 2\cdot16 = 32;$
Perimetrni hisoblaymiz:
$P = 2(x+y) = 2\cdot 40 = 80;$ **Javob: A.**

2012-1v-8

$\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} 4\cos2x\,dx$ ni hisoblang.

A) -4 B) 3 C) 6 D) $\sqrt{3} - 2$

Yechish:

$$\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} 4\cos2x\,dx = \left|_{\frac{\pi}{4}}^{\frac{\pi}{3}} \right.(4\frac{1}{2}\sin2x) =$$

$$2\left(\left(\sin\frac{2\pi}{3}\right) - \left(\sin\frac{2\pi}{4}\right)\right) = 2\left(\frac{\sqrt{3}}{2} - 1\right) = \sqrt{3} - 2.$$

Javob: D.

2012-1v-9

Sport maktabining 3 ta seksiyasida 120 ta sportchi bor. Konkichilar chang'ichilarning 0,8 qismini, xokkeychilar esa konkichilar va chang'ichilarning umumiy sonining $33\frac{1}{3}\%$ ini tashkil etadi. Xokkeychilar seksiyasida nechta sportchi bor?

A) 100 B) 40 C) 30 D) 50

Yechish: Konkichilar sonini x bilan, chang'ichilar sonini y bilan va xokkeychilar sonini z bilan belgilab olamiz. Z=?

Masala shartlariga ko'ra quyidagiga egamiz:

$$\begin{cases} x + y + z = 120 \\ x = 0{,}8y \\ z = \frac{33\frac{1}{3}}{100}(x+y) \end{cases};$$

Ikkinchi tenglikni 1 va 3 – tengliklarga qo'yamiz:

$$\begin{cases} 0{,}8y + y + z = 120 \\ z = \frac{1}{3}(0{,}8y + y) \end{cases};$$

Birinchi tenglikdan y ni topamiz:

1,8y=120-z; $y = \frac{120-z}{1{,}8};$

Va $z = \frac{1}{3}\cdot 1{,}8\cdot\frac{120-z}{1{,}8} = \frac{120-z}{3};$

$3z = 120 - z;\ 4z = 120;$

Z=30. **Javob: C.**

2012-1v-10

3 ga bo'linmaydigan butun sonning kvadratidan bittaga kam bo'lgan son, qaysi songa qoldiqsiz bo'linadi?

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

Yechish: 3 ga bo'linmaydigan butun sonlar ikki ko'rinishi mavjud:

1) 3n+1;
2) 3n+2

Bu ikki sonning kvadratlarini hisoblaymiz:

$(3n+1)^2 = 9n^2 + 6n + 1 = 3(3n^2 + 2n) + 1;$

$(3n+2)^2 = 9n^2 + 12n + 4 = 3(3n^2 + 4n + 1) + 1$

Ikkala kvadrat ham 3 ga bir qoldiq bilan bo'linishi ma'lum bo'ldi. Demak bu sonlardan bir ayrilsa ularning har ikkisi ham 3 ga qoldiqsiz bo'linadi.

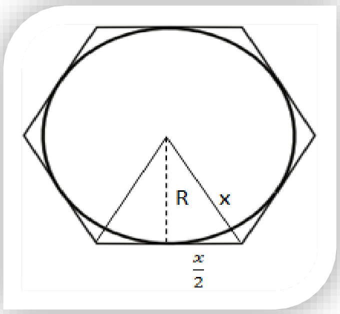
Javob: B.

2012-1v-11

R radiusli aylanaga tashqi chizilgan muntazam oltiburchakning tomonini toping.

A) *1,2R* B) $\frac{2\sqrt{3}}{3}R$ C) $\frac{2\sqrt{2-\sqrt{3}}}{\sqrt{2+\sqrt{3}}}R$ D) *1,5R*

Yechish: Chizmani chizib olamiz:



Pifagor teoremasiga ko'ra:

$x^2 = R^2 + (\frac{x}{2})^2;$

$x^2 - \frac{x^2}{4} = R^2;$

$\frac{3x^2}{4} = R^2;$

Bundan quyidagiga ega bo'lamiz:

$x = \frac{2R}{\sqrt{3}} = \frac{2\sqrt{3}R}{3};$ **Javob: B.**

2012-1v-12

$x^5 - 16x > 0$ tengsizlikning eng kichik butun musbat va eng katta butun manfiy yechimlari ko'paytmasini toping.

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

Yechish: Ko'paytuvchilarga ajratib olamiz:

$x(x^4 - 16) > 0,$

1-xol: $\begin{cases} x > 0 \\ x^4 < 16 \end{cases}$ bunda:

$x^4<16$,

$-2<x<2$,

x>0 bo'lgani uchun $x \in (0;2)$.

2-xol: $\begin{cases} x < 0 \\ x^4 > 16 \end{cases}$ bunda:

$x^4>16$,

x<-2 va x>2,

x<0 bo'lgani uchun $x \in (-\infty;-2)$.

Tengsizlikning umumiy yechimi: $(-\infty;-2) \cup (0;2)$ bo'ladi. Eng kichik butun musbat yechim 1 va eng katta butun manfiy yechim -3 bo'ladi.

1·(-3)=-3. **Javob: A.**

2012-1v-13

k ning qanday qiymatlarida *k(x+2)=6* tenglamaning ildizlari musbat bo'ladi?

A) $(0;\infty)$ C) $(-3;0)$
B) $(3;\infty)$ D) $(0;3)$

Yechish: Tenglamani yechamiz va no'malumni 0 dan katta qilib *k* ning qiymatini topamiz:

1-xol: k>0bo'lsin.

$x + 2 = \frac{6}{k}$; $x = \frac{6}{k} - 2$;

$\frac{6}{k} - 2 > 0$; $\frac{6}{k} > 2$;

6>2k; *k<3.*

K>0 ekanligidan $k \in (0;3)$ kelib chiqadi.

2-xol: k<0 bo'lganda tenglamaning yechimi ham manfiy bo'ladi. Demak $k \in (0;3)$ da tenglamaning yechimi musbat bo'ladi. **Javob: D.**

2012-1v-14

$2 \cdot 3^{cos^2x} = 15 - 9^{cos^2x}$ tenglamani yeching.

A) $\pi n,\ n \in Z$ C) $\pm\frac{2\pi}{3} + 2\pi n,\ n \in Z$
B) $2\pi n,\ n \in Z$ D) $\frac{\pi}{3} + 2\pi n,\ n \in Z$

Yechish: $2 \cdot 3^{cos^2x} = 15 - 9^{cos^2x}$,

$9^{cos^2x} + 2 \cdot 3^{cos^2x} = 15$; $(3^{cos^2x})^2 + 2 \cdot 3^{cos^2x} = 15$; $(3^{cos^2x})^2 + 2 \cdot 3^{cos^2x} + 1 = 15 + 1$;

$(3^{cos^2x} + 1)^2 = 16$;

1º. $3^{cos^2x} + 1 = -4$, bunda tenglama yechimga ega emas.

2º. $3^{cos^2x} + 1 = 4$;

$3^{cos^2x}=3$; $cos^2x = 1$;

$cosx = \pm 1$; $x = \arccos(\pm 1)$;

$x = \pi n, n \in Z$. **Javob: A.**

2012-1v-15

Hisoblang: $log_2 6 - log_2 20 + log_2 \frac{3}{5}$

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

Yechish: $log_2 6 - log_2 20 - log_2 \frac{3}{5} =$
$log_2(2 \cdot 3) - log_2(4 \cdot 5) - (log_2 3 - log_2 5) =$
$log_2 2 + log_2 3 - (log_2 4 + log_2 5)$
$-(log_2 3 - log_2 5) =$
$1 + log_2 3 - 2 - log_2 5 - log_2 3 + log_2 5 = -1.$

Javob: D.

2012-1v-16

$\frac{(0,(5)+0,(1))}{1,5^{-1}} \cdot 10 - 2\frac{1}{2} : 3\frac{3}{4} + (2\frac{1}{2} - 1\frac{1}{9}) \cdot 3$ ni hisoblang.

A) 9 B) $15\frac{2}{3}$ C) $12\frac{1}{2}$ D) $16\frac{1}{3}$

Yechish:

1. $0,(5) + 0,(1) = 0,(6) = \frac{2}{3}$;
2. $1,5^{-1} = \left(\frac{3}{2}\right)^{-1} = \frac{2}{3}$;
3. $\frac{\frac{2}{3}}{\frac{2}{3}} = 1$;
4. $1 \cdot 10 = 10$;
5. $2\frac{1}{2} : 3\frac{1}{4} = \frac{5}{2} : \frac{15}{4} = \frac{5}{2} \cdot \frac{4}{15} = \frac{2}{3}$;
6. $10 - \frac{2}{3} = \frac{28}{3} = 9\frac{1}{3}$;
7. $2\frac{1}{2} - 1\frac{4}{9} = \frac{5}{2} - \frac{13}{9} = \frac{9 \cdot 5 - 2 \cdot 13}{18} = \frac{45-26}{18} = \frac{19}{18} = 1\frac{1}{18}$;
8. $1\frac{1}{18} \cdot 3 = \frac{19}{18} \cdot 3 = \frac{19}{6} = 3\frac{1}{6}$;
9. $9\frac{1}{3} + 3\frac{1}{6} = \frac{28}{3} + \frac{19}{6} = \frac{56+19}{6} = \frac{75}{6} = \frac{25}{2} = 12{,}5$

Javob: C.

2012-1v-17

$-2;\ 3t - 2;\ 3t - 14$ sonlar kamayuvchi geometric progressiyaning ketma – ket 3 ta hadlari bo'ladigan t ning barcha qiymatlari yig'indisini yoki t ning qiymatini (agar u butun bo'lsa) toping.

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

Yechish: Shartga ko'ra:

$b_1 = -2$; $b_2 = 3t - 2$; $b_3 = 3t - 14$;va

$b_1 > b_2 > b_3$ bo'lishi kerak. Bundan esa:

$$\begin{cases} -2q = 3t - 2 \\ -2q^2 = 3t - 14 \end{cases};$$

bu yerda q progressiyaning maxraji.

$$-2q^2 + 2q + 12 = 0;$$
$$q^2 - q - 6 = 0;$$
$$q_1 = -2, \text{va} q_2 = 3.$$

q_1 dan foydalanib t ni topamiz:

$-2q = 3t - 2$; $3t = 2 - 2q = 2 - 2 \cdot (-2) = 6$; $t = 2$,

bu qiymatdan ketma – ketlik hadlarini topamiz:

$$b_1 = -2;$$
$$b_2 = 3t - 2 = 4;$$
$$b_3 = 3t - 14 = -8.$$

Topilgan sonlar $b_1 > b_2 > b_3$ shartni qanoatlantirmaydi, chunki $b_1 < b_2$. Endi q_2 dan foydalanib $t$ni topamiz:

$$-2q = 3t - 2;$$

$3t = 2 - 2q = 2 - 2 \cdot (3) = -4;$

$t = -\frac{4}{3}$, bu qiymatdan ketma – ketlik hadlarini topamiz:

$$b_1 = -2;$$
$$b_2 = 3t - 2 = -6;$$
$$b_3 = 3t - 14 = -18.$$

Topilgan sonlar $b_1 > b_2 > b_3$ shartni qanoatlantirdi, demak $t = -\frac{4}{3}$. **Javob: A.**

2012-1v-18

$y = -2x^3 + 6x$ funksiyaning minimum qiymatini hisoblang.

A) -16 B) -4 C) -8 D) 0

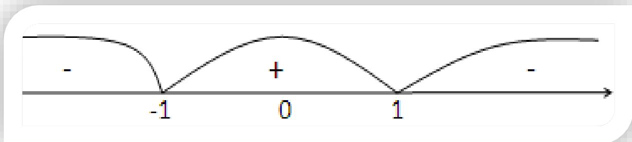
Yechish: $y' = -6x^2 + 6;$

$$-6x^2 + 6 = 0;$$
$$x^2 = 1;$$
$$x = \pm 1;$$

-2: $-(-2)^2 + 1 = -3;$

0: $-(0)^2 + 1 = 1;$

2: $-(2)^2 + 1 = -3;$



Hosilaning qiymati manfiydan musbatga o'zgarish nuqtasi funksiyaning minimum qiymati bo'ladi. Demak *x=-1*nuqtada funksiya minimumga erishadi.

$$y_{min} = -2 \cdot (-1)^3 + 6 \cdot (-1) = -4;$$

Javob: B.

2012-1v-19

Agar $m - n = (4x + y)^2$ va $m - n = (4x - y - 32)^2$ bo'lsa, $x - y$ ning qiymatini hisoblang.

A) -20 B) -15 C) -6 D) -9

Yechish: $(4x + y)^2 = (4x - y - 32)^2$

$(4x + y)^2 = ((4x + y) + (32 - 2y))^2$

$(4x^2 + y)^2 = (4x + y)^2 + 2(4x + y)(32 - 2y) + (32 - 2y)^2$

$(32 - 2y)\big(2(4x + y) + (32 - 2y)\big) = 0;$

Bu yerda $\big(2(4x + y) + (32 - 2y)\big) = 0$ deb olamiz va $8x + 2y + 32 - 2y = 0;$

$8x = -32$ bundan $x = -4$ ni topamiz.

Endi $32 - 2y = 0$ deb olamiz va

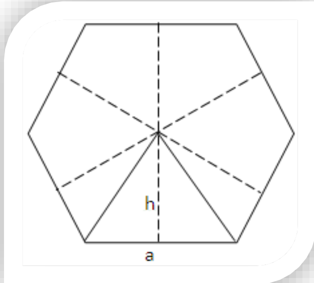
$y = 16$ ni topamiz. Demak, $x - y = -4 - 16 = -20.$ **Javob: A.**

2012-1v-20

Muntazam oltiburchak ichidagi ixtiyoriy nuqtada n uning tomonlari yotgan to'g'ri chiziqlargacha bo'lgan masofa yig'indisi 9 ga teng bo'lsa, shu oltiburchakning yuzini toping.

A) $5{,}5\sqrt{3}$ B) $5\sqrt{3}$ C) $6\sqrt{3}$ D) $4{,}5\sqrt{3}$

Yechish: Ixtiyoriy nuqta sifatida oltiburchakka ichki chizilgan aylana markazini olamiz.



U holda, $6h = 9$; $h = 1{,}5$ kelib chiqadi.

Pifagor teoremasiga ko'ra:

$a^2 - \left(\frac{a}{2}\right)^2 = (1{,}5)^2;$ $\frac{3a^2}{4} = 2{,}25;$

$a^2 = 3;$ $a = \sqrt{3};$

Oltiburchak yuzini hisoblaymiz:

$$S = 6 \cdot \left(\frac{1}{2}ah\right) = 3ah = 3 \cdot \sqrt{3} \cdot 1{,}5 = 4{,}5 \cdot \sqrt{3}.$$

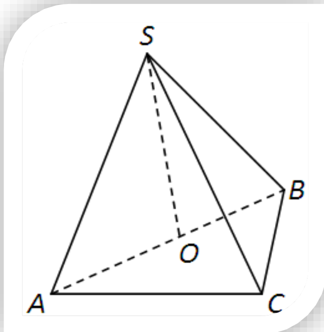
Javob: D.

2012-1v-21

Yon qirralari 13 ga teng piramida asosi – katetlari 6 va 8 ga teng bo'lgan to'g'ri burchakli uchburchakdan iborat. Piramida balandligini toping.

A) 12 B) 14 C) 13 D) 15

Yechish: Piramidaning yon qirralari tengligi uchun ularni asosdagi proyeksiyalarining uzunliklari ham teng bo'ladi. Shuning uchun bu proyeksiyalar asosdagi uchburchakning uchlaridan uchburchakka tashqi chizilgan aylana markazigacha bo'lgan kesmalar bilan ustma-ust tushadi. Asosdagi uchburchak to'g'ri burchakli bo'lganligi uchun bu kesmalar gipotenuzaning o'rtasida tutashadi ya'ni $AO = OB = OS$. Pifagor teoremasiga ko'ra $AB^2 = AC^2 + BC^2$;



Bundan, $AB = 10$ ni topamiz. Yana pifagor teoremasini qo'llaymiz: $OS^2 + AO^2 = SB^2$; bundan $OS^2 = SB^2 - AO^2 = 13^2 - 5^2 = 144;$

$SO = 12.$ **Javob A.**

2012-1v-22

$log_{36}(log_2 25 \cdot log_5 8)$ ifodaning qiymatini toping.

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

Yechish: $log_{36}(log_2 25 \cdot log_5 8) = log_{36}(log_2 8 \cdot log_5 25) = log_{36}(3 \cdot 2) = log_{36} 6 = \frac{1}{2}$

Javob: D.

2012-1v-23

$1 - 2sin4x < cos^2 4x$ tengsizlikni yeching.

A) $\left(-\frac{\pi}{2} + 2\pi k; \frac{\pi}{2} + 2\pi k\right), k \in Z$

B) $\left(-\frac{\pi}{4} + 2\pi k; \frac{\pi}{4} + 2\pi k\right), k \in Z$

C) $\left(\pi k; \frac{\pi}{2} + \pi k\right), k \in Z$

D) $\left(\frac{\pi k}{2}; \frac{\pi}{4} + \frac{\pi k}{2}\right), k \in Z$

Yechish: $1 - 2sin4x < cos^2 4x;$

$$sin^2 4x + cos^2 4x - 2sin4x < cos^2 4x;$$
$$sin^2 4x - 2sin4x < 0;$$
$$sin4x(sin4x - 2) < 0;$$

$x$ningharqandayqiymatidahams$in4x - 2 < 0$bo'lganiuchunyuqoridagitengsizlik$sin4x > 0$tengsizlikgatengkuchlibo'ladi.

$$arcsin(0^\circ) + 2\pi n < 4x < \pi - arcsin(0^\circ) + 2\pi n;$$
$$2\pi n < 4x < \pi + 2\pi n;$$
$$\frac{\pi n}{2} < x < \frac{\pi}{4} + \frac{\pi n}{2}$$

Demak: $x \in \left(\frac{\pi n}{2}; \frac{\pi}{4} + \frac{\pi n}{2}\right)$, bu yerda $n \in Z$.

Javob D.

2012-1v-24

$x^2 - 4x + |x - 4| > 0$ tengsizlikni yeching.

A) $(-\infty; 1] \cup (4; \infty)$ C) $(1; 4)$

B) $(-\infty; 1) \cup (4; \infty)$ D) $(-\infty; 4) \cup (4; 10)$

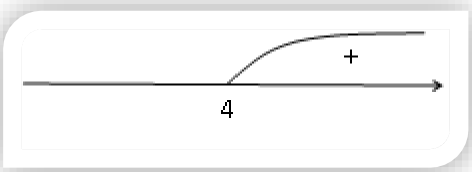
Yechish: $x^2 - 4x + |x - 4| > 0;$

$$x(x - 4) + |x - 4| > 0;$$

$x \geq 4$da:

$$x(x - 4) + x - 4 > 0;$$
$$(x - 4)(x + 1) > 0;$$

$f(x) = (x - 4)(x + 1)$funksiya uchun$x \geq 4$ bo'lgandagi ishoralar egri chizig'ini chizamiz:

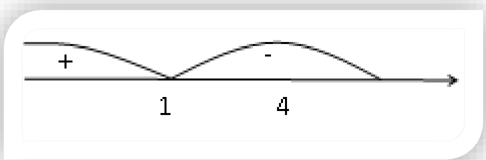


Demak $x \in (4; \infty)$.

$x < 4$ bo'lganda:

$$x(x - 4) - (x - 4) > 0;$$
$$(x - 4)(x - 1) > 0;$$

$f(x) = (x - 4)(x + 1)$funksiya uchun $x < 4$ bo'lgandagi ishoralar egri chizig'ini chizamiz:



bu yerda $x \in (-\infty; 1)$.

Umumiy xolda $x \in (-\infty; 1) \cup (4; \infty)$ bo'ladi.

Javob B.

2012-1v-25

$\frac{x^2-2x-8}{\sqrt{x^2+10}} > 0$tengsizlikning eng kichik butun musbat va eng katta butun manfiy yechimlari ayirmasini toping.

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

Yechish: Avval kasrning maxrajini hisoblab olamiz:

$$x^2 + 10 > 0; \qquad x^2 > -10;$$
$$x^2 > 0; \qquad x \neq 0.$$

Endi kasrning surat qismini hisoblaymiz:

$x \neq 0$ bo'lmagan ixtiyoriy qiymatda kasrning maxraji musbat bo'ladi. Shuning uchun kasrning suratini ham musbatga aylantiradigan qiymatlar tengsizlikning yechimlari bo'ladi.

$$x^2 - 2x - 8 > 0;$$
$$(x - 4)(x + 2) > 0;$$

$f(x) = (x - 4)(x + 2)$funksiya uchun ishoralar egri chizig'ini chizamiz:

ko'rinadiki: $x \in (-\infty; -2) \cup (4; \infty)$.

$x$qiymatlari$x \neq 0$ ni qanoatlantirmoqda.

x ning qabul qiladigan qiymatlari orasida eng katta butun manfiy qiymat -3 ga teng va eng kichik butun musbat qiymat esa 5 ga teng.

$5 - (-3) = 8$. **Javob D.**

2012-1v-26

Hisoblang: $cos^2 35^\circ + cos^2 55^\circ$

A) 0 B) 0,5 C) 2 D) 1

Yechish: Bu yerda $\cos 35^\circ = \sin(90^\circ - 35^\circ) = sin55^\circ$ekanlagidan foydalanamiz:

$cos^2 35^\circ + cos^2 55^\circ = sin^2 55^\circ + cos^2 55^\circ$,

$\boldsymbol{sin^2\alpha + cos^2\alpha = 1}$formulaga ko'ra:

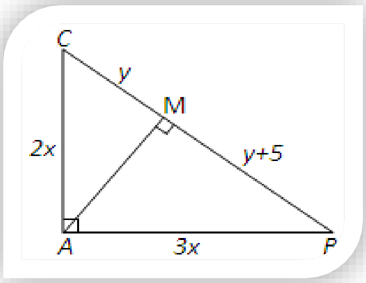
$sin^2 55^\circ + cos^2 55^\circ = 1$ bo'ladi. **Javob D.**

2012-1v-27

Katetlarining nisbati 3:2 kabi bo'lgan to'g'ri burchakli uchburchakning balandligi gipotenuzasini uzunliklaridan biri ikkinchisinikidan 5 ga ko'p bo'lgan ikki qismga ajratadi. Berilgan uchburchakning gipotenuzasini toping.

A) 13 B) 15 C) 9 D) 7,8

Yechish: Shaklni chizib olamiz va **Pifagor teorema**siga ko'ra quyidagilarga egamiz:



$$\begin{cases}(2x)^2+(3x)^2=(2y+5)^2\\(2x)^2-y^2=(3x)^2-(y+5)^2\end{cases}$$

Birinchi tenglikdan x^2ni topib ikkinchi tenglikka qo'yamiz:

$$(2x)^2+(3x)^2=(2y+5)^2;$$
$$4x^2+9x^2=4y^2+20y+25;$$
$$13x^2=4y^2+20y+25;$$
$$x^2=\frac{4y^2+20y+25}{13};$$
$$(2x)^2-y^2=(3x)^2-(y+5)^2;$$
$$4\cdot\frac{4y^2+20y+25}{13}-y^2=9\cdot\frac{4y^2+20y+25}{13}-y^2-10y-25;$$

Tenglikning har ikki tomonini 13 ga ko'paytirib hisoblaymiz:

$$4\cdot(4y^2+20y+25)-13y^2=$$
$$9\cdot(4y^2+20y+25)-13y^2-130y-325;$$

O'xshash xadlarni ixchamlab yozamiz:

$$20y^2-30y-200=0;$$
$$2y^2-3y-20=0;$$

Diskriminantni hisoblaymiz:

$$D=b^2-4ac=(-3)^2-4\cdot2\cdot(-20)=$$
$$9+160=169.$$

y ning qiymatini hisoblaymiz:

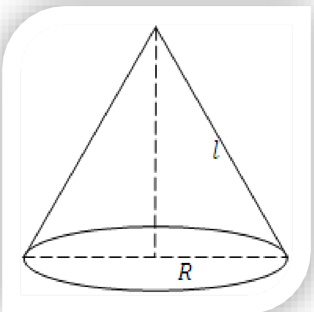
$$y_{1,2}=\frac{-b\pm\sqrt{D}}{2a}=\frac{-(-3)\pm\sqrt{169}}{2\cdot2}=\frac{3\pm13}{4};$$

$y$faqat musbat qiymat qabul qiladi, shuning uchun $y=\frac{3+13}{4}=4$ qiymatni olamiz.

y ning qiymatidan foydalanib gipotenuzani topamiz: $|AB|=2y+5=13.$ **Javob A.**

2012-1v-28

Teng tomonli konus o'q kesimining yuzi $16\sqrt{3}$ ga teng. Shu konus yon sirtining yuzini toping.



A) 32π B) 34π C) 30π D) 28π

Yechish: Shaklni chizib olamiz:
Konusning o'q kesimi teng tomonli uchburchak bo'lganligi uchun $l=2R$ bo'ladi. Teng tomonli uchburchakning yuzini topish formulasiga ko'ra:

$S=\frac{\sqrt{3}}{4}l^2=16\sqrt{3};\ l^2=64;$

$l=8$ va $R=4.$

Konusning yon sirtini formula bo'yicha topamiz:

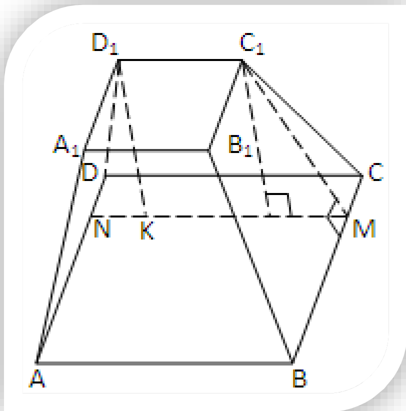
$S_{yon}=\pi Rl=32\pi.$ **Javob A.**

2012-1v-29

To'g'ri burchakli muntazam kesik piramida asoslarining tomonlari 8 va 2 ga, balandligi 4 ga teng. Uning to'la sirtini toping.

A) 169 B) 170 C) 168,1 D) 168

Yechish: Shaklni chizib olamiz:



Shakldan ko'rinadiki ABB_1A_1, BCC_1B_1, CDD_1C_1va $ADD_1A_1$to'rtburchaklar (teng yonli trapetsiyalar) o'zaro teng. Bundan kelib chiqib kesik piramidaning to'la sirti $S_{to'la}=S_{ABCD}+S_{A_1B_1C_1D_1}+4S_{BCC_1B_1}$formula bilan hisoblanadi. Barcha to'rtburchaklarning yuzalarini aloxida – aloxida hisoblab olamiz:

1. $S_{ABCD}=AB^2=8^2=64;$
2. $S_{A_1B_1C_1D_1}=(A_1B_1)^2=2^2=4;$
3. BCC_1B_1trapetsiyaning asoslari 2 va 8 ga teng bo'ladi. Balandligi esa MC_1 bo'ladi. Demak avval MC_1 ning uzunligini hisoblab olish kerak. C_1Oham kesik piramidaning balandligi bo'lgani uchun uning uzunligi ham 4 ga teng. $KO=D_1C_1=2$bundan esa $OM=\frac{NM-KO}{2}=\frac{8-2}{2}=3$ kelib chiqadi. Pifagor teoremasiga ko'ra: $(MC_1)^2=(C_1O)^2+OM^2=4^2+3^2=25.$ $MC_1=\sqrt{25}=5.$ Trapetsiyaning yuzini hisoblaymiz: $S_{BCC_1B_1}=\frac{2+8}{2}\cdot5=25.$

Topilganlardan foydalanib kesik piramidaning to'la sirtini hisoblaymiz:

$$S_{to'la}=S_{ABCD}+S_{A_1B_1C_1D_1}+4S_{ABB_1A_1}$$
$$=64+4+4\cdot25=168$$

Javob: D.

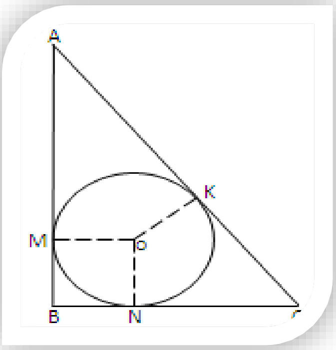
2012-1v-30

To'g'ri burchakli uchburchakka ichki chizilgan aylana uzunligi 10π, gipotenuzasi 25 ga teng. Uchburchakning yuzini toping.

A) 175 B) 125 C) 150 D) 120

Yechish: Shaklni chizib olamiz:

Aylana uzunligi $l = 2\pi r$ formulasidan $r = \frac{l}{2\pi} = \frac{10\pi}{2\pi} = 5$ kelib chiqadi.



Shakldan ko'rinadiki: $r = OM = ON = MB = BN =$ 5bo'ladi.

Bir nuqtadan aylanaga o'tkazilgan ikki urinma teng bo'ladi, shunga ko'ra: $AM = AK$ va $KC = NC$ bo'ladi.

$AC = 25$ekanligidan$KC = 25 - AK$ bo'ladi. Pifagor teoremasiga ko'ra: $AB^2 + BC^2 = AC^2$;

$(AM + MB)^2 + (BN + NC)^2 = 25^2$;

$AM = AK, NC = KC$ va $MB = BN = 5$ ekanligidan: $(AK + 5)^2 + (5 + KC)^2 = 625$;

$KC = 25 - AK$almashtirishni bajaramiz:

$(AK + 5)^2 + (5 + 25 - AK)^2 = 625$;

$AK^2 + 10AK + 25 + 900 - 60AK + AK^2 = 625$;

$2AK^2 - 50AK + 925 = 625$;

$2AK^2 - 50AK + 300 = 0$;

$AK^2 - 25AK + 150 = 0$;

Tenglamani yechib $AK_1=10$ va $AK_2=15$ natijalarni olamiz. Ixtiyoriy bir yechimni tanlash imkoniyatimiz borligi uchun AK=10 qiymatni qabul qilamiz.

Demak, $AB = AM + MB + AK + 5 = 10 + 5 = 15$ va $BC = BN + NC = 5 + KC = 5 + (25 - AK) = 5 + (25 - 10) = 20$;

Uchburchakning yuzini topamiz:

$S = \frac{1}{2}AB \cdot BC = \frac{1}{2} \cdot 15 \cdot 20 = 150.$ **Javob: C.**

2012-1v-31

Nechta butun son $3^{\sqrt{5-x}} \leq (x-4)ln(x-4)$ tengsizlikni qanoatlantiradi?

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

Yechish: $1^\circ.\ 5 - x \geq 0 \Rightarrow x \leq 5$;

$2^\circ.\ x - 4 > 0 \Rightarrow x > 4$;

Demak $x = 5$ bo'lishi mumkin bo'lgan yagona xolat.

$x = 5$ datengsizlikni har ikki tomonini hisoblaymiz:

$3^{\sqrt{5-5}} = 3^0 = 1;\ (5-4)ln(5-4) = ln1 = 0$;

1>0 bo'lganligi uchun tengsizlik yechimga ega emas. **Javob: D.**

2012-1v-32

Kasrni qisqartiring: $\frac{ax-bx+ay-by}{ax+bx+ay+by}$

A) $\frac{2b}{a+b}$ B) $\frac{a-b}{a+b}$ C) $\frac{2a}{a+b}$ D) $\frac{b-a}{a+b}$

Yechish:

$\frac{ax - bx + ay - by}{ax + bx + ay + by} = \frac{a(x+y) - b(x+y)}{a(x+y) + b(x+y)} = \frac{(x+y)(a-b)}{(x+y)(a+b)} = \frac{a-b}{a+b}$ **Javob: B.**

2012-1v-33

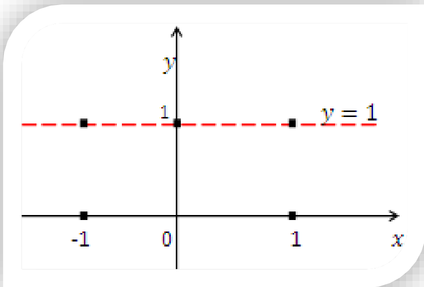
$u = \frac{1}{x^2}$va $y = x^2$ funksiyalarning grafiklari kesishgan nuqtalardan o'tuvchi to'g'ri chiziqning tenglamasini toping.

A) y=-1 B) y=x C) y=-2 D) y=1

Yechish: Berilgan funksiyalarni bir – biriga tenglab olamiz: $u = y \Leftrightarrow \frac{1}{x^2} = x^2$;

$x^4 = 1$; $x = \pm 1$;

$x = 1$ da $y = 1$ bo'ladi va $x = -1$ day $= 1$ bo'ladi.



Grafikdan ko'rinadiki $\boldsymbol{x = -1}$ va $\boldsymbol{x = 1}$ bo'lganda $\boldsymbol{y}$ ning qiymati 1 ga teng bo'lmoqda, demak $\boldsymbol{y = 1}$ to'g'ri har ikki nuqtadan o'tadi. **Javob: D.**

2012-1v-34

$a = \sqrt{45 \cdot 10 \cdot 18}$ va $b = \sqrt[3]{16 \cdot 36 \cdot 81}$ sonlarning eng kichik umumiy karralisi va eng katta umumiy bo'luvchisi ayirmasini toping.

A) 72 B) 154 C) 162 D) 54

Yechish: $a = \sqrt{45 \cdot 10 \cdot 18} = \sqrt{9 \cdot 5 \cdot 5 \cdot 2 \cdot 2 \cdot 9} = 9 \cdot 5 \cdot 2 = 3^2 \cdot 5 \cdot 2$;

$b = \sqrt[3]{16 \cdot 36 \cdot 81} = \sqrt[3]{4^2 \cdot 4 \cdot 9 \cdot 9^2} = 4 \cdot 9 = 2^2 \cdot 3^2$;

a va b sonlarining eng kichik umumiy karralisi:

EKUK=$2^2 \cdot 3^2 \cdot 5 = 180$ ga teng bo'ladi.

a va b sonlarining eng katta umumiy bo'luvchisi:

EKUB= $2 \cdot 3^2$=18 ga teng bo'ladi.

EKUK-EKUB=180-18-162. **Javob: C.**

2012-1v-35

Istalgan *A,B,C* nuqtalar uchun qaysi tengsizlik o'rinli?

A) $AB < AC + BC$ C) $AC > AB + BC$

B) $AB > AC + BC$ D) $BC > AB + AC$

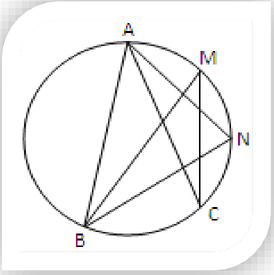
Yechish:

A,B,C nuqtalar biror uchburchakning uchlari deb olinsa, uchburchakning ixtiyoriy tomoni uzunligi boshqa ikki tomoni uzunliklarining yig'indisidan kichik bo'lish xossasiga ko'ra:$AB<AC+BC$tengsizlik o'rinli bo'ladi.

Javob: A.

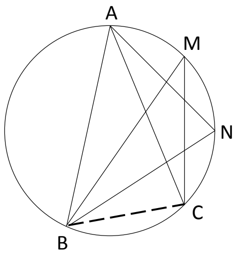
2012-1v-36

Shaklda $AB=AC$va $\angle BMC=40^\circ$ bo'lsa, $\angle ANB$ necha gradusga teng bo'ladi?



A) 60^0 C) 80^0
B) 50^0 D) 70^0

Yechish: $\angle BAC$ va $\angle BMC$bitta yoyga ya'ni BC ga tiralganligi uchun bu burchaklar teng bo'ladi: $\angle BAC = \angle BMC = 40^\circ$.



$AB=AC$bo'lgani va $\angle BAC = 40^\circ$ ligi uchun $\angle ABC = \angle ACB = \frac{180^\circ - 40^\circ}{2} = 70^\circ$ bo'ladi.

$\angle ACB$ va$\angle ANB$ bitta yoyga ya'ni, AB ga tiralganligi uchun bu burchaklar teng bo'ladi:$\angle ANB = \angle ACB = 70^\circ$. **Javob: D.**

Muallif Farg'ona v. Marg'ilon shahar tibbiyot kollejining Informatika va axborot texnologiyalari fani o'qituvchisi *ISLOMOV ERKINJON*.

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