Variant-5

1. $47{,}8\cdot 10^n = 0{,}0000478$

$47{,}8\cdot 10^n = 47{,}8\cdot 10^{-6}$

$n=-6$ (A)

2. $\sqrt[3]{\frac{400\sqrt{23^2-17^2}}{\sqrt{0{,}6}}} = \sqrt[3]{400\cdot\sqrt{\frac{6\cdot 40}{0{,}6}}} =$

$= \sqrt[3]{400\cdot 20} = 20$ (D)

3. $\dfrac{a^{\frac{1}{3}}\cdot c^2 - 3b^{\frac{1}{2}}}{(c^2+3)(a^{\frac{1}{3}}+\sqrt{b})} + \dfrac{3a^{\frac{1}{3}}+b^{\frac{1}{2}}\cdot c^2}{(c^2-3)(a^{\frac{1}{3}}+\sqrt{b})}{}^{-1}$

$\dfrac{a^{\frac{1}{3}}c^4 - 3c^2b^{\frac{1}{2}} - 3a^{\frac{1}{3}}c^2 + 9b^{\frac{1}{2}} + 3a^{\frac{1}{3}}c^2 + b^{\frac{1}{2}}c^4 + 9a^{\frac{1}{3}} + 3b^{\frac{1}{2}}c^2}{(c^4-9)(a^{\frac{1}{3}}+\sqrt{b})}{}^{-1} - 1$ (C)

$= \dfrac{a^{\frac{1}{3}}(c^4+9) + b^{\frac{1}{2}}(9+c^4)}{(c^4-9)(a^{\frac{1}{3}}+\sqrt{b})} - 1 = \dfrac{c^4+9}{c^4-9} - 1 = \dfrac{18}{c^4-9}$

4. $a<0 \quad b<0 \quad c>0$

$\sqrt{b^2} + |b-c| + |c-a| + b = -b - b + c + c - a + b =$

$= 2c - a - b$ (C)

5. $x<-2$

$\sqrt{x^2+5x+2+\sqrt{4-4x+x^2}} = \sqrt{x^2+5x+2+\sqrt{(x-2)^2}} =$

$= \sqrt{x^2+5x+2+|x-2|} = \sqrt{x^2+5x+2-x+2} = \sqrt{x^2+4x+4}$

$= |x+2| = -x-2$ (D)

6. $3500\cdot 6\cdot 0{,}06 = 1260$ (B)

7. $3(2-x) - 8 = 10 \quad 3(2-x) = 18$

$2-x=6 \quad x=-4.$ (A)

8. $\begin{cases} x+y+z=10 \\ y+z+u=6 \\ z+u+x=8 \\ u+x+y=9 \end{cases}$ $x+2y+3z+4u$

$3x+3y+3z+3u = 33$

$x+y+z+u = 11$

$u=1 \quad x=5 \quad y=3 \quad z=2.$

$5+2\cdot 3+3\cdot 2+4\cdot 1 = 21.$

(B)

9. $x<-1 \quad y>1$

$y^3 > x^3$ (B)

10. $\left|\frac{10-2x}{1+2x}\right| > 0.$

$10-2x \neq 0. \quad x \neq 5.$

$1+2x \neq 0. \quad x \neq -\frac{1}{2}.$

(A)

11.

$\{a-\sqrt{a}\} + \{a+\sqrt{a}\}$

a - biror natural sonning kvadrati bo'lmasa, ushbu yig'indi 1 ga teng

a - biror natural sonning kvadrati bo'lsa, ushbu yig'indi 0 ga teng.

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

$\{3+\sqrt{3}\} + \ldots + \{2017-\sqrt{2017}\} +$

$\{2017+\sqrt{2017}\} = 1973$ (C)

12. $10; 14; 18; \dots$

$a_1 = 10 \quad d = 4$.

$a_n = a_1 + (n-1)d$

$110 = 10 + (n-1)\cdot 4$

$100 = (n-1)\cdot 4$

$25 = n-1 \quad n = 26$ (A)

13. $\frac{1}{\sin 200^\circ} - \frac{\sqrt{3}}{\cos 200^\circ} =$

$= \frac{\sqrt{3}\cos 200^\circ - \sin 200^\circ}{\sqrt{3}\sin 200^\circ \cdot \cos 200^\circ} =$

$= \frac{2\left(\frac{\sqrt{3}}{2}\cos 200^\circ - \frac{1}{2}\sin 200^\circ\right)}{\sqrt{3}\sin 200^\circ \cdot \cos 200^\circ} =$ (D)

$= \frac{2\sin(60^\circ - 200^\circ)}{\frac{\sqrt{3}}{2}\cdot \sin 400^\circ} = \frac{-2\sin 140^\circ}{\frac{\sqrt{3}}{2}\sin 40^\circ} = -\frac{4}{\sqrt{3}}$

14. $\arcsin(\sin 1) = 1$ (A)

15. $\sin x + \cos x = \sqrt{2}$.

$\sqrt{2}\sin(x+45^\circ) = \sqrt{2}$.

$\sin(x+45^\circ) = 1$.

$x + 45^\circ = 90^\circ + 360^\circ n$

$x = 45^\circ + 360^\circ n$. (A)

16. $x = (0,6 + 0,0\dot{6})\cdot(0,6 - 0,06) +$
$(0,8 + 0,08)(0,8 - 0,08) =$

$x = 0,6^2 - 0,06^2 + 0,8^2 - 0,08^2 =$

$= 1 - (0,06^2 + 0,08^2) =$

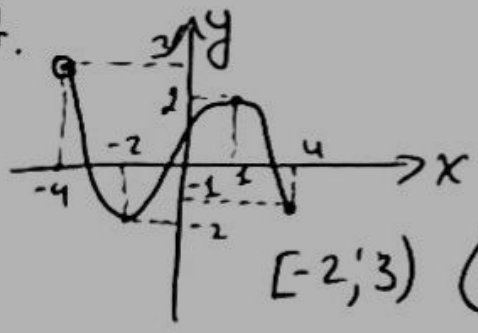
$= 1 - 0,1 = 0,9$.

$\sqrt[3]{0,9}$ – Bu eng kattasi°

$0,9^3$ – Bu eng kichigi°

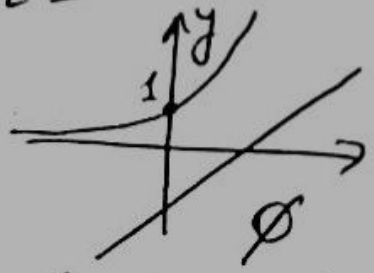
(D).

17.



$[-2; 3)$ (B)

18. $2^x = x - 2$



(D)

19. $\log_a b = x$. $\log_b a = \frac{1}{x}$ $\log_a \frac{a}{b} =$
$= 1 - x$

$\frac{64 - (4x)^3}{(x + \frac{1}{x} + 1)(1-x)} \cdot \frac{1}{4x} =$

$= \frac{64(1-x^3)}{\frac{(x^2+x+1)}{x}(1-x)} \cdot \frac{1}{4x} = 16$ (D).

20. $\frac{3x^2 - 16x + 21}{\log_{0,3}(x^2+6)} < 0$

$\log_{0,3}(x^2+6) < 0$.

$3x^2 - 16x + 21 > 0$.

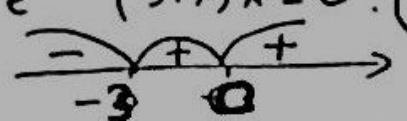
$(3x-7)(x-3) > 0$

$(-\infty; \frac{7}{3}) \cup (3; \infty)$ (B)

21. $f(x) = x^3 \cdot e^{x+7}$

$f'(x) = 0 \quad 3x^2 \cdot e^{x+7} + x^3 \cdot e^{x+7} = 0$.

$e^{x+7}(3+x)x^2 = 0$. -3 (B)



22. $y = \cos 3x \cdot \cos 12x$

$y = \frac{1}{2}(\cos 15x + \cos 9x)$

$y = \frac{1}{2}\cos 15x + \frac{1}{2}\cos 9x$

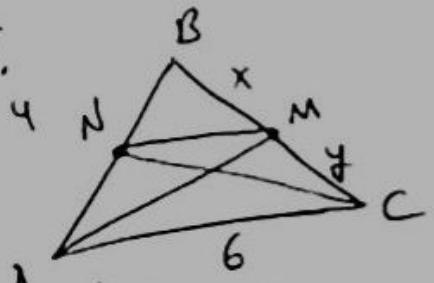
$Y = \frac{1}{30}\sin 15x + \frac{1}{18}\sin 9x + C$

(D)

23. 2) 3) 5) (D)

24. $C_9^6 = \frac{9!}{6!3!} = \frac{7 \cdot 8 \cdot 9}{6} = 84$ (B)

25.



$\begin{cases} 6x = 4y \\ x + y = 4. \end{cases}$

$6 \cdot \frac{8}{5} = 4y$

$x + 1{,}5x = 4.$

$2{,}5x = 4.$

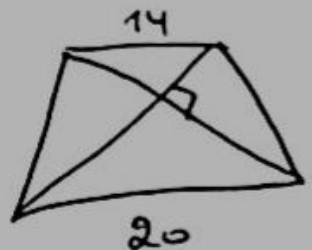
$x = \frac{8}{5}.$

$y = \frac{12}{5}.$

$\frac{MN}{6} = \frac{x}{x+y}$

$MN = \frac{8}{20} \cdot 6 = \frac{48}{20} = 2{,}4$ (B)

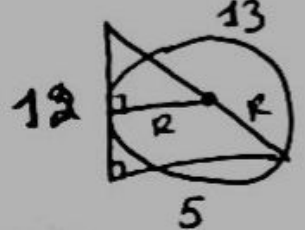
26.



$S = \left(\frac{20+14}{2}\right)^2$

$S = 289$ (B)

27.



$\frac{13-R}{13} = \frac{R}{5}$

$R = \frac{65}{18}$ (D)

28. $3x + 2y = 1$

$M(-4; 0)$

$\begin{cases} 3x+2y=1 \ (\times 3) \\ 2x+3y=2 \ (\times 2) \end{cases}$

$\Theta \begin{cases} 9x+6y=3 \\ 4x+6y=4 \end{cases}$

$5x = -1$

$x = -\frac{1}{5}$

$2x + 3y = 2$

$\begin{cases} 3x+2y=1 \ (\times \\ 2x+3y=2 \ (\times 3) \end{cases}$

$\begin{cases} 6x+4y=2 \\ 6x+9y=6 \end{cases} \Theta$

$5y = 4$

$y = \frac{4}{5}.$

$\frac{x-x_1}{x_1-x_2} = \frac{y-y_1}{y_1-y_2}$ $\quad \frac{x+\frac{1}{5}}{-\frac{1}{5}+4} = \frac{y-\frac{4}{5}}{\frac{4}{5}-0}$

$\frac{5x+1}{19} = \frac{5y-4}{4}$

$20x + 4 = 95y - 76.$

$4x - 19y + 16 = 0$ (A)

29.

$\sin\alpha = \frac{\sqrt{3}}{4}$ $\quad h = \frac{\sqrt{3}}{2}a$

$\frac{H}{a} = \sin\alpha$

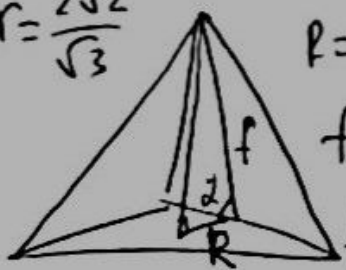
$\frac{H}{h} = \sin\beta.$

$H = a\sin\alpha = h\sin\beta.$

$a \cdot \frac{\sqrt{3}}{4} = \frac{\sqrt{3}}{2} a \sin\beta.$

$\sin\beta = \frac{1}{2}$ $\quad \beta = 30^\circ$

30. $r = \frac{2\sqrt{2}}{\sqrt{3}}$



$R = \frac{\sqrt{3}}{6}a$

$f = \frac{\sqrt{3}}{2}a$

$\frac{R}{f} = \frac{\frac{\sqrt{3}}{6}a}{\frac{\sqrt{3}}{2}a} = \frac{1}{3}$

$r = \frac{\sin\alpha}{1+\cos\alpha} \cdot R$ $\quad \cos\alpha = \frac{1}{3}$

$\frac{2\sqrt{2}}{\sqrt{3}} = \frac{\frac{2\sqrt{2}}{3}}{1+\frac{1}{3}} \cdot \frac{\sqrt{3}}{6}a$ $\quad a = 8.$ (A)

Variant - 6

1. $\overline{x853y}$ $\begin{matrix}5\\\wedge\\5\ 11\end{matrix}$

$y=0 \quad x=6;$

$y=5 \quad x=1;$

$6+1=7$ (A)

2. $\frac{8}{7}\cdot\frac{9}{8}\cdot\frac{10}{9}\cdots\frac{63}{62}=\frac{63}{7}=9$ (A)

3. $(x+a-3)^{2018}+x-4$

$P(0)=0$

$(a-3)^{2018}-4=0.$

$a-3=\pm\sqrt[2018]{4}$

$a_{1;2}=3\pm\sqrt[2018]{4}$

$a_1+a_2=6$ (D)

4. $x+\frac{1}{x}=6 \qquad x^3+\frac{1}{x^3}=\left(x+\frac{1}{x}\right)^3-3\cdot\frac{1}{x}\left(x+\frac{1}{x}\right)$

(C) $\qquad x^3+\frac{1}{x^3}=6^3-3\cdot6=216-18=198$

6. $\frac{100-4c^2-4cd-d^2}{20c+10d-4c^2-4cd-d^2}=\frac{10^2-(2c+d)^2}{10(2c+d)-(2c+d)^2}=$

$=\frac{(10-2c-d)(10+2c+d)}{(2c+d)(10-2c-d)}=\frac{10+2c+d}{2c+d}$ (A)

6. $(\vartheta_m+\vartheta_0)\cdot3=\vartheta_0\cdot12$

$\vartheta_m=3\vartheta_0$

$(\vartheta_m-\vartheta_0)\cdot t=\vartheta_0\cdot12$

$2\vartheta_0\cdot t=\vartheta_0\cdot12$

$t=6$ (A)

7. $\frac{x^7-4x^5+4x^2-7x-2}{x^7-4x^5+3x^2-4x-4}=1.$

$x^7-4x^5+4x^2-7x-2=x^7-4x^5+3x^2-4x-4$

$x^2-3x+2=0 \quad x\neq2 \quad x=1$ (B)

8. $(x^2+14x+14)(x^2+x+14)=14x^2$

$x^2+14=a.$

$(a+14x)(a+x)=14x^2$

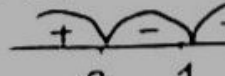
$a^2+15ax+14x^2=14x^2$

$a(a+15x)=0$

$(x^2+14)(x^2+15x+14)=0$

$x=-1 \quad x=-14$ (B)

9. $a^2<a \qquad a^2-a<0 \qquad a(a-1)<0.$



$(0;1)$

$x=a^{1947} \quad y=a^{1960} \quad z=a^{2019}$

$z<y<x$ (C)

10. $(2x-7)^6+\sqrt{x+1}\geq1$

$x+1\geq0 \qquad x\geq-1.$ (A)

11. $|a|<1, \quad |b|<1$

$a+ab+ab^2+ab^3+\ldots=\frac{3}{4}$

$\begin{cases}\frac{a}{1-b}=\frac{3}{4}\\ \frac{b}{1-a}=\frac{2}{3}\end{cases}\begin{cases}4a=3-3b\\3b=2-2a\end{cases}\begin{matrix}a=\frac{1}{2}\\b=\frac{1}{3}\end{matrix}$

$b+ba+ba^2+ba^3+\ldots=\frac{2}{3}$

$12ab=12\cdot\frac{1}{2}\cdot\frac{1}{3}=2.$ (D)

12. $S_2=3 \qquad S_3-S_2=b_3$

$S_3=7 \qquad b_3=4.$

$S_7=?$

$\begin{cases}\frac{b_1(q^2-1)}{q-1}=3\\ b_1q^2=4\end{cases}\begin{cases}b_1(q+1)=3\\b_1q^2=4\end{cases}$

$\frac{q+1}{q^2}=\frac{3}{4} \qquad q=2 \qquad b_1=1.$

$S_7=\frac{1\cdot(2^7-1)}{2-1}=127$ (A)

13. $\sqrt{\sin\alpha-\sqrt{\sin\alpha-\sqrt{\sin\alpha-\ldots}}}=\frac{1}{2}$

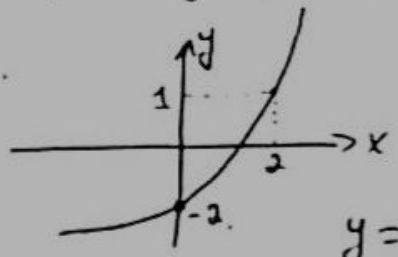
$\sqrt{\sin\alpha-\frac{1}{2}}=\frac{1}{2} \qquad \sin\alpha=\frac{1}{4}+\frac{1}{2}$

$\sin\alpha=\frac{3}{4}$ (A)

14. $(\sin 161^\circ + \sin 41^\circ)(\sin 139^\circ + \sin 19^\circ) -$
$- (\sin 49^\circ - \sin 109^\circ)(\sin 131^\circ - \sin 71^\circ) =$
$[\sin x = \sin y \quad x+y = 180^\circ]$
$= (\sin 19^\circ + \sin 41^\circ)^2 - (\sin 71^\circ - \sin 49^\circ)^2 =$
$= (2\sin 30^\circ \cos 11^\circ)^2 - (2\cos 60^\circ \sin 11^\circ)^2 =$
$\cos^2 11^\circ - \sin^2 11^\circ = \cos 22^\circ$ (B)

15. $\sin^{100} x + \cos^{100} x = 1$
$\sin x = \pm 1 \Rightarrow \cos x = 0$
$\cos x = \pm 1 \Rightarrow \sin x = 0$.
$x = \frac{\pi}{2} n; \; n \in Z$ (A)

16. $f(x) = 0{,}7^x \quad g(x) = 0{,}8^x \quad h(x) = 0{,}9^x$
$f(44) = 0{,}7^{44} \quad g(33) = 0{,}8^{33} \quad h(21) = 0{,}9^{21}$
$f(44) = 0{,}2401^{11} \quad g(33) = 0{,}512^{11} \quad h(22) = 0{,}81^{11}$
$f(44) < g(33) < h(22)$ (A)

17.


(2; 1)
(0; -2)
$y = 2^x - 3$ (D)

18. $(e+1)^x > \sqrt{x}$
$x \geq 0 \quad [0; \infty)$ (B)

19. $y = \ln(x^2 - 2x - 2) > 0$.
$x^2 - 2x - 2 > 1$.
$x^2 - 2x - 3 > 0$
$(-\infty; -1) \cup (3; \infty)$ (A)

20. $3^{\log_2(2x-3)} = (2x^2 - 10x + 13)^{\log_2 3}$
$(2x-3) = (2x^2 - 10x + 13) \quad 2+4=6$
$2x^2 - 12x + 16 = 0$
$x^2 - 6x + 8 = 0 \quad x=2 \quad x=4$ (C)

21. $\log_{x-2}(2x-7) > 1$
$\begin{cases} x-2 > 1 \\ 2x-7 > x-2 \\ 2x-7 > 0 \end{cases} \quad \begin{cases} x > 3 \\ x > 5 \\ x > 3{,}5 \end{cases} \Rightarrow \boxed{x > 5}$ (C)
$\begin{cases} 0 < x-2 < 1 \\ 2x-7 < x-2 \\ 2x-7 > 0 \end{cases} \quad \begin{cases} 2 < x < 3 \\ x < 5 \\ x > 3{,}5 \end{cases} \quad \emptyset$

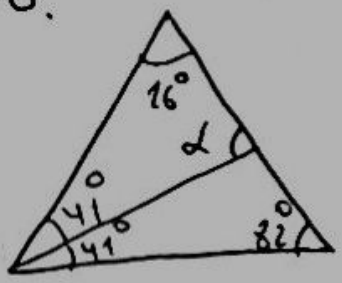
22. $y = x^2 - |2x-4|$
$x = 3 \quad y = 7 \quad k = 2x-2 = 4 \quad y = 4(x-3)+7 \quad y = 4x-5$
$x = -3. \quad y = -1. \quad k = 2x+2 = -4 \quad y = -4(x+3)-1 \quad y = -4x-13$
$\begin{cases} y = 4x-5 \\ y = -4x-13 \end{cases}$ (+)
$2y = -18$
$y = -9$
$-9 = 4x-5.$
$-4 = 4x$
$x = -1$ (D)

23. $\int x^2 \cdot \sin x \, dx =$
$[\sin x \, dx = dv \quad x^2 = u \quad -\cos x = v \quad 2x\,dx = du]$
$= \int -x^2 \cdot \cos x + 2\int x \cos x \, dx =$
$[u = x \quad \cos x \, dx = dv \quad du = dx \quad \sin x = v]$
$= -x^2 \cdot \cos x + 2 \cdot (x \cdot \sin x - \int \sin x \, dx) =$
$= -x^2 \cdot \cos x + 2x \sin x + 2\cos x + C$ (B)

24. $m_a = \frac{1}{2}\sqrt{2b^2 + 2c^2 - a^2}$ (D)

25. $A \cap B = \{b; c; d\}$
$A \cap C = \{b; d\}$
$A \cap (B \cup C) = (A \cap B) \cup (A \cap C) =$
$\{b; c; d\}$ (D).

26.



$\alpha = 82^\circ + 41^\circ = 123^\circ$ (D)

27. $\begin{cases} a - b = 8 \\ h_b - h_a = 4 \\ a \cdot h_a = b \cdot h_b \end{cases}$

$a = 8 + b$

$h_b = 4 + h_a$

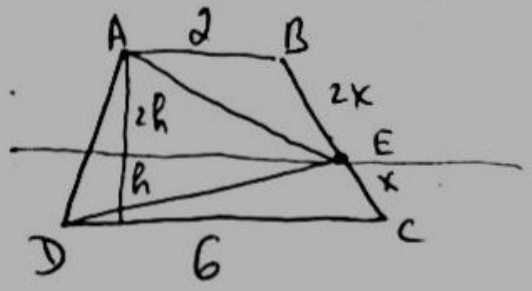
$(8+b)h_a = b(4+h_a)$

$8h_a + b \cdot h_a = 4b + b h_a$

(B)

$\sin\alpha = \frac{h_a}{b} = \frac{1}{2} \quad \alpha = 30^\circ$

28.



$\frac{6+2}{2} \cdot 3h = 36 \quad h = 3$

$S_{ADE} = 36 - \frac{2 \cdot 2h}{2} - \frac{6 \cdot h}{2} =$

$= 36 - 6 - 9 = 21$ (B)

29. $\frac{1}{3} < \frac{3}{8} < \frac{1}{2}$ (B)

30. $R = 11\sqrt{2} \quad r = 2\sqrt{2} \quad R_s = ?$

$\frac{1}{3}\pi H^2 (R^2 + r^2 + Rr) = \pi R_s^2 H$

$\frac{1}{3}(121 \cdot 2 + 8 + 22 \cdot 2) = R_s^2$ (A)

$R_s = 7\sqrt{2}$

7-Variant

@ALPHRAGANUS

(1) $2^2+6^2+10^2+14^2+18^2-$
$-1-5^2-9^2-13^2-17^2=$
$=3+6^2-5^2+10^2-9^2+14^2+13^2-$
$+18^2-17^2=3+11+19+27$
$+35=\frac{3+35}{2}\cdot 5=95$ (B)

(2) $\frac{(-)}{\frac{1}{2\cdot 2\cdot 2}(-)}=\frac{1}{8}$ (D)

(3) $a^2-(b^2-c^2+2bc)$
$a+b-c$
$a+b+c$
$a^2-(b^2-2bc+c^2)$
$\frac{a+b-c}{a+b+c}$
$a^2-(b-c)^2\cdot\frac{a+b+c}{a+b-c}$
$(a+b+c)(a+b-c)\frac{a+b+c}{a+b-c}$
$=(a-b+c)(a+b+c)$
$=(3-\sqrt{3}-1)(3+\sqrt{3}-1)$
$=2\cdot 1\,(2-\sqrt{3})(2+\sqrt{3})$
$=1$ (A)

(4) $(a+b)^3-(a-b)^3-8b^3$
$=(a+b-a+b)((a+b)^2+$
$+a^2-b^2+(a-b)^2)-$
$-8b^3=6b(a-b)(a+b)$ (20)

(5) $132\leftarrow\begin{cases}\text{nok}=x\\ \text{olmo}=4x\\ \text{olxöri}\cdot x=18\end{cases}$
$6x+18=132$
$6x=150\ ;\ x=25$
(D) $4\cdot x=100$

(7) $x(x+3)+(x+3)\sqrt{\frac{x}{x+3}}-2=$
$x(x+3)+\sqrt{x(x+3)}-2=$
$a^2+a-2=0$
$a=-2$ $\quad a=1$
$x^2+3x=4$ $\quad x^2+3x=1$
$x=-4;\ x=1$ $\quad -\frac{3\pm\sqrt{13}}{2}$
$-4;\ \frac{\sqrt{13}-3}{2}$ (B) $\frac{\sqrt{13}-3}{2}$

(8) $x^2-2(m+1)x+1=0$
$D>0\ ;\ m+1>0$
$m^2+2m>0$
$m(m+2)>0$
$m>-1$
$(0;\infty)$ (A)

(9) $\frac{(x-1)(x-4)}{\sqrt{3+5x-2x^2}}<0$
$(x-1)(x-4)<0$
$2x^2-5x-3<0$
$(-\frac{1}{2};3)$
(A) $(1;3)$

(10) $|x+4|(|x-2|+|x-4|)>$
$2|x+4|(x-3$

(11) $\frac{5x+11}{(x+2)(x-1)}=\frac{a(x-2)+b(x-1)}{(x-1)(x-2)}$
$5x+11=ax-2a+bx-b$ 1)
$5x+11=(a+b)x-2a-b$ 2)
$+\begin{cases}a+b=5\\ -2a-b=11\end{cases}$ $\quad a=-16$ 3)
$b=21$ 4)
$a(-16;5)$ (D)

$|x-2|+|x-4|>2|x-3$

1) $6-2x>6-2x$ ~
2) $2>6-2x\ ;\ x>2$
3) $2>2x-6\ ;\ x<4$
4) $-6>-6$
$2+1=3$ (C)

(11) 3, 9, 15, ...
$d = 6$ (C)

(12) $n - \log 8$
$n^2 - (n-2)^2 = 15^2$
$n^2 - n^2 + 4n - 4 = 15^2$
$4n = 15^2$
$n = 39$; $39 - 2237$ (A)

(13) $-\operatorname{tg}\alpha \cdot \operatorname{tg}\beta +$
$+ (\operatorname{tg}\alpha - \operatorname{tg}\beta) \cdot$
$\cdot \operatorname{ctg}(\alpha - \beta)$
$-\operatorname{tg}\alpha \cdot \operatorname{tg}\beta + (\operatorname{tg}\alpha - \operatorname{tg}\beta) \cdot$
$\cdot \frac{1 + \operatorname{tg}\alpha \cdot \operatorname{tg}\beta}{(\operatorname{tg}\alpha - \operatorname{tg}\beta)}$
$-\operatorname{tg}\alpha \cdot \operatorname{tg}\beta + 1 + \operatorname{tg}\alpha \operatorname{tg}\beta$
$= 1$ (B)

(14) $m = a\cos x + b \cdot \sin x$
$n = \sqrt{a^2 + b^2}$
$-\sqrt{a^2+b^2} \le m \le \sqrt{a^2+b^2}$
$m \ge n$
$m - n \ge 0$.
$n \to$ ning eng kichik qiymati.
$-2\sqrt{a^2+b^2} \le m+n \le 0$ (A)

(15) $\sin x + \cos x = \sqrt{2}$
$\sqrt{2}\left(\frac{1}{\sqrt{2}}\sin x + \frac{1}{\sqrt{2}}\cos x\right) = \sqrt{2}$
$\cos 45^\circ \sin x + \sin 45^\circ \cos x = 1$
$\sin\left(x + \frac{\pi}{4}\right) = 1$.
$x + \frac{\pi}{4} = \frac{\pi}{2} + 2\pi n$
$x = \frac{\pi}{4} + 2\pi n$ (A)

(16) $y = 3x - 3$.
$y = -0{,}5x - a$
Kesishsa $y_1 = y_2$
$x > 0$
$y > 0$.
$3x - 3 = -0{,}5x - a$
$3x + 0{,}5x = 3 - a$
$3{,}5x = 3 - a$
$x = \frac{3-a}{3{,}5}$
$3 - a > 0$ $(a < 3)$
$y = \frac{3(3-a) - 3 \cdot 3{,}5}{3{,}5}$
$y = \frac{9 - 3a + 10{,}5}{3{,}5}$
$y = \frac{-3a - 1{,}5}{3{,}5}$
$-3a - 1{,}5 > 0$
$-3a > 1{,}5$ (D)
$a < -\frac{1}{2}$ ✓

(17) x ni ozgarish oraligi
$[-4; 4)$ kesma (D)

(18) $3 \cdot 9^{x+1} + 2 \cdot 3^{x+1} - 1 = 0$
$3 \cdot 9^x \cdot 9 + 2 \cdot 3^x \cdot 3 - 1 = 0$
$27 \cdot 9^x + 6 \cdot 3^x - 1 = 0$
$3^x = R \;/\; 27 \cdot R^2 + 6R - 1 = 0$
$R_{1,2} = \frac{-6 \pm 12}{2 \cdot 27}$
$R_1 = -\frac{1}{3}$? $R_2 = \frac{3}{27} = \frac{1}{9}$.
$3^x = 3^{-2}$ $(x = -2)$ (B)

(19) $\frac{\lg(1 + \frac{1}{2} + \frac{1}{4} + \dots)}{\lg(2 + \frac{2}{3} + \frac{2}{9} + \dots)}$
$\left(\log_2 3 + \frac{1}{2}\log_2 3 + \frac{1}{4}\log_2 3\right.$
1) $1 + \frac{\frac{1}{2}}{1 - \frac{1}{2}} = 2$
2) $2 + \frac{2}{3} \cdot \frac{3}{2} = 3$. (A)
$\frac{\lg 2}{\lg 3} \cdot \log_2 3 \left(1 + \frac{1}{2} + \frac{1}{4}\right.$
$\log_3 x \cdot \log_2 3 \cdot (1+1) =$

(20) $\log_4(x-7) \le \log_4(2$
$1 \le \log_4\left(\frac{20-x}{x-7}\right.$
$(7; 20)$
$\frac{20-x}{x-7} \ge 4$
$\frac{48 - 5x}{x-7} \ge 0$
$\frac{5x - 48}{x-7} \le 0$
$(7; 9{,}6)$ $8 + 9 = 17$ (D)

(21) $f(\sin^2 x) = \cos^2$
$f((\sin^2 x) = ?$
$f(\sin^2 x) = 1 - \sin^2$
$\sin^2 x = t$
$f(t) = 1 - t$
$f'(t) = -1$. (B)

@ALPHRAGANUS

(23) $f(x)=A\cdot 2^x+B$

$f'(1)=(\ln 2)^2$

$\int_0^2 f(x)dx=\frac{1}{2}$

$f'(x)=A\cdot 2^x\ln 2$

$f'(1)=2A\ln 2$

$\int_0^2 (A\cdot 2^x+B)dx=$

$=\frac{A\cdot 2^x}{\ln 2}+Bx\Big|_0^2$

$2A\ln 2=(\ln 2)^2$

$A=\frac{\ln 2}{2}$

$\frac{4A}{\ln 2}+2B=\frac{A}{\ln 2}=\frac{1}{2}$

$\frac{3A}{\ln 2}+2B=\frac{1}{2}$

$\frac{3\ln 2}{2\cdot\ln 2}+2B=\frac{1}{2}$

(B) $2B=-1;\ B=-\frac{1}{2}$

(24) D 1 da 4

(24) $A=\{x:|x-2|<3, x\in\mathbb{N}\}$

(B) $-3<x-2<3$

$-1<x<5$

1 2 3 4 4ta

(25)

$3a=2c$

$a^2+5^2=c^2$

$a^2+25=\frac{9}{4}a^2$

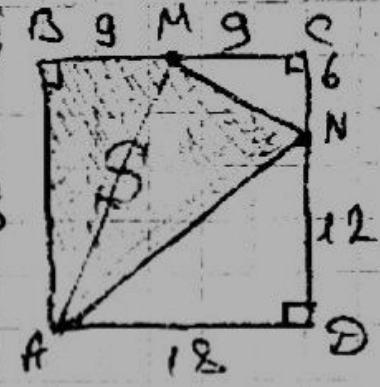
$25\cdot 4=5a^2$

$a^2=5\cdot 4$

$a=2\sqrt{5}$

$S=\frac{2\sqrt{5}\cdot 5}{2}=5\sqrt{5}$

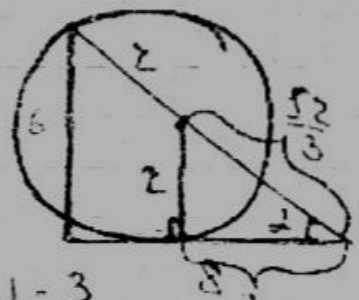
(26)



$S_{ABMN}=S_{ABCD}-(S_{ABN}+S_{MNC})=$

$=18^2-(27+108)=189$ (B)

(27)



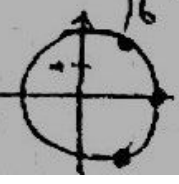
$\operatorname{tg}\alpha=\frac{3}{4}$

$z+\frac{5z}{3}=10$

$z=\frac{3}{8}\cdot 10=\frac{15}{4}$

(B) $S_{doira}=z^2\pi=14\frac{1}{16}\pi$

(28)



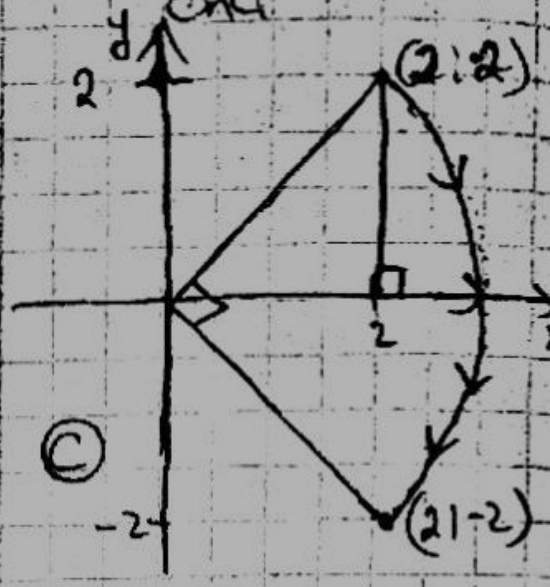
(2;2)

$y<0;\ x>0$

(C) (2;-2)

(28) 28-gg ĝosh.

cha



(29) $\vec{b}\ (2;3;-1)$

$\vec{a}\ (x;y;z)$

$\vec{a}=\lambda\cdot\vec{b}$ -> kollinia - lik shartli

$x\cdot 2+y\cdot 3+z(-1)=\vec{a}\vec{b}=28$

$2\cdot\lambda\cdot 2+3\lambda\cdot 3+(-1)\lambda(-1)=28$

$4\lambda+9\lambda+\lambda=28$

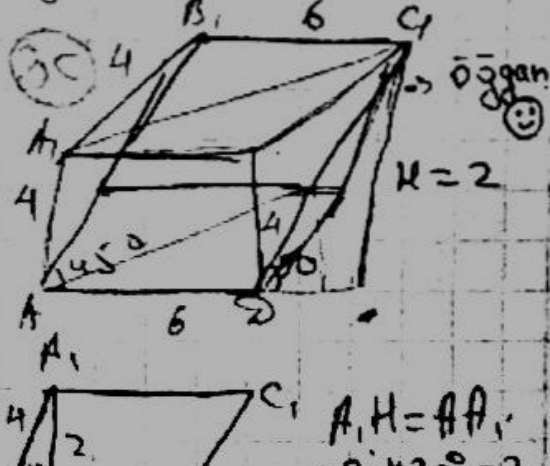
$14\lambda=28$

$\lambda=2$

$\vec{a}=2\vec{b}=(4;6;-2)$

$x+y+z=4+6-2=8$ (D)

(30)



-> o'ggan

$h=2$

$A_1H=AA_1\cdot\sin 30°=2$

$V=S_{as}\cdot h=4\cdot 6\cdot\sin 45°\cdot 2=24\sqrt{2}$ (B)

Variant - 8

1. $a = 64 \cdot n + n^3$

$64 > n^3$

$n = 3$

$a = 64 \cdot 3 + 3^3$

$a = 219$ (A)

2. $\frac{a+b}{3a-2b} = \frac{32}{26} = \frac{16}{13}$

$\begin{cases} a+b=16 \\ 3a-2b=13 \end{cases}$ $a=9$, $b=7$ (A)

3. $(x+2)(x+4)(x+6)(x+8)+16 =$

$= (x^2+10x+16)(x^2+10x+24)+16 =$

$= a \cdot (a+8) + 16 = a^2 + 8a + 16 =$

$= (a+4)^2 = (x^2+10x+20)^2 \to 0$ (A)

4. $\frac{5ab+7bc-2ac}{ab+3bc} = 2$ $\quad \frac{b}{a} \cdot \frac{a+c}{a-c}$

$b+c$

$5ab+7bc-2ac = 2ab+6bc$

$3ab-2ac+bc=0$

$2ab-2ac+ab+bc=0$

$2a(b-c)+b(a+c)=0$

$2a(b-c) = -b(a+c)$

$-2 = \frac{b}{a} \cdot \frac{a+c}{b-c}$ (C)

5. $\frac{4x^2-4x+1}{4} = (x+a)^2$

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

$a = -\frac{1}{2}$ (A)

6. $|4\sqrt{3}-7| - |5\sqrt{2}-7| =$

$7 - 4\sqrt{3} - 5\sqrt{2} + 7 = 14 - 4\sqrt{3} - 5\sqrt{2}$ (D)

7. $\begin{cases} x+y=36 \\ x=y+6 \end{cases}$

$y+y+6=36$

$y=15$

$x=21$ (B)

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

$x_1^4 + x_2^4 = p^4 + 4p^2q + 2q^2$

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

$= 16 + 32 + 8 = 56$ (B)

9. $\begin{cases} 2x+y=7 \\ |x-y|=2 \end{cases}$

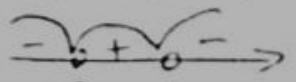
1) $\begin{cases} 2x+y=7 \\ x-y=2 \end{cases}$ $x=3$, $y=1$

2) $\begin{cases} 2x+y=7 \\ x-y=-2 \end{cases}$ $x=\frac{5}{3}$, $y=\frac{11}{3}$

$3+1+\frac{5}{3}+\frac{11}{3} = 4+\frac{16}{3} =$

$= 9\frac{1}{3}$ (D)

10. $(3-x)(x+2) > 0$



(B)

$(-2;3)$

$-1+0+1+2=2$

11. $\begin{cases} 1 \le x \le 25 \\ \frac{5}{2} \le y \le 7 \end{cases}$ $\frac{x}{y} = ?$

$\frac{1}{7} \le \frac{x}{y} \le 10$ (B)

12. $d = 2$

$a_1^2 + a_3^2 + a_5^2 + a_7^2 = a_2^2 + a_4^2 + a_6^2 + 57$

$a_3 = ?$

$a_3^2 = a_2^2 - a_1^2 + a_4^2 - a_3^2 + a_6^2 - a_5^2 + 57$

$a_3^2 = 2(a_2 + a_1 + a_4 + a_3 + a_6 + a_5) + 57$

$(a_1+12)^2 = 2(6a_1+30)+57$

$a_1^2 + 24a_1 + 144 = 12a_1 + 60 + 57$

$a_1^2 + 12a_1 + 27 = 0$

$-9 \quad -3$

$a_1 < -5$

$a_1 = -9$

$a_7 = a_1 + 6d = 3$ (C)

13. $\frac{-tg(\frac{\pi}{4} - \frac{\alpha}{2})(1+\sin\alpha)}{\sin\alpha} =$

$= \frac{\frac{1-tg\frac{\alpha}{2}}{1+tg\frac{\alpha}{2}}(1+\sin\alpha)}{\sin\alpha} =$

$= \frac{\frac{\cos\frac{\alpha}{2}-\sin\frac{\alpha}{2}}{\cos\frac{\alpha}{2}+\sin\frac{\alpha}{2}}(1+\sin\alpha)}{\sin\alpha}$

$= \frac{(\cos\frac{\alpha}{2}-\sin\frac{\alpha}{2})(\cos\frac{\alpha}{2}+\sin\frac{\alpha}{2})}{\sin\alpha}$

$= \frac{\cos^2\frac{\alpha}{2} - \sin^2\frac{\alpha}{2}}{\sin\alpha} = \frac{\cos\alpha}{\sin\alpha}$

$= ctg\alpha$ (C)

14. $\frac{2018}{\pi} \cdot \operatorname{arctg}(\cos 2019\pi) =$

$= \frac{2018}{\pi} \cdot \operatorname{arctg}(-1) = \frac{2018}{\pi} \cdot \frac{3\pi}{4} =$

$= 1513{,}5$ (A)

15. $\operatorname{tg} 3x \le -\sqrt{3} \quad \left[-\frac{\pi}{2}; \frac{\pi}{2}\right]$

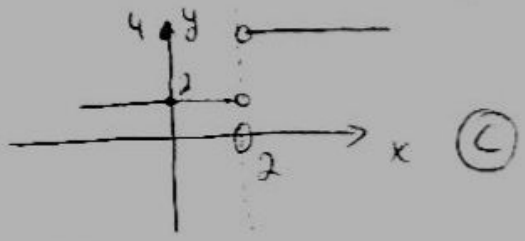
$-\frac{\pi}{2} + \pi n < 3x \le -\frac{\pi}{3} + \pi n; \quad n \in \mathbb{Z}$

$-\frac{\pi}{6} + \frac{\pi n}{3} < x \le -\frac{\pi}{9} + \frac{\pi n}{3}; \quad n \in \mathbb{Z}$

$\left(-\frac{\pi}{6}; -\frac{\pi}{9}\right] \left(\frac{\pi}{6}; \frac{2\pi}{9}\right] \left[-\frac{\pi}{2}; -\frac{4\pi}{9}\right]$

(B)

16. $y = \frac{|x-2|}{x-2} + 3$ $\quad x > 2 \quad y = 4$ $\quad x < 2 \quad y = 2$



(C)

17. (D)

18. $2^x > \sqrt{x} \quad x \ge 0$ (A)

19. $\log_3 7 + \log_7 3 < 3$ (B)

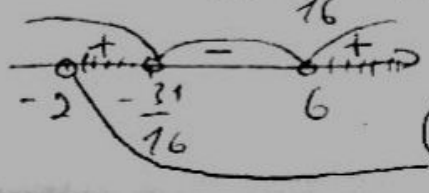
$\log_3 7 > 1{,}7 \quad \log_7 3 > 0{,}5$

20. $(\log_2(x+2) - 3)(\log_2(x+2) + 4) > 0$

$\log_2(x+2) = 3 \quad \log_2(x+2) = -4$

$x+2 = 8 \quad x+2 = \frac{1}{16}$

$x = 6 \quad x = -\frac{31}{16} \quad x+2 > 0$

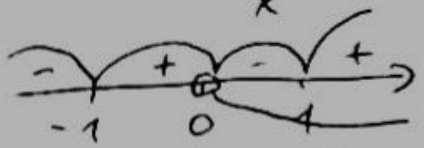


(D)

21. $y = x^4 - 4\ln x \quad x > 0$

$y' = 4x^3 - \frac{4}{x} = 0$

$\frac{4(x-1)(x+1)(x^2+1)}{x} = 0$



maks (+) → (−).

M.E. (C)

22. $\int x \cdot f^{-1}(x+2)\,dx = 2x^2 - 3x + C$

$x f^{-1}(x+2) = 4x - 3$

$f^{-1}(x+2) = \frac{4x-3}{x}$

$x+2 = a. \quad x = a-2.$

$f^{-1}(a) = \frac{4a-8-3}{a-2} = \frac{4a-11}{a-2} = y.$

$4a - 11 = ay - 2y$

$4a - ay = 11 - 2y$

$a = \frac{11-2y}{4-y}$

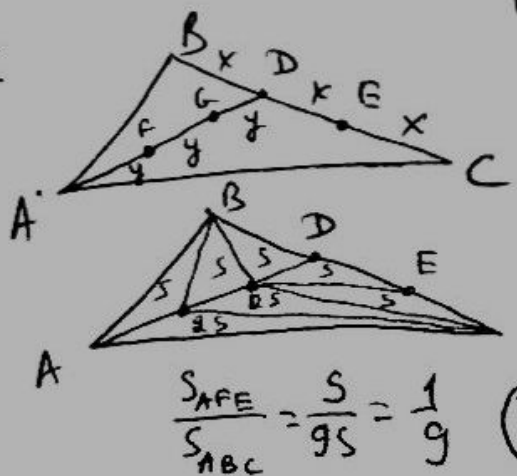
$f(x) = \frac{2x-11}{x-4}$ (C)

23. 1) 2) (D)

24. $\frac{1}{(n+4)!} - \frac{1}{(n+5)!} = \frac{n+5-1}{(n+5)!} = \frac{n+4}{(n+5)!}$

(B)

25.



$\frac{S_{AFE}}{S_{ABC}} = \frac{S}{9S} = \frac{1}{9}$ (D)

26.

$r = \frac{a+a-\sqrt{2}a}{2} = \frac{2-\sqrt{2}}{2}a$

$R = \frac{\sqrt{2}a}{2}$ (C)

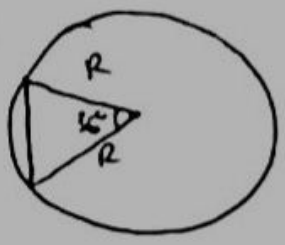
$\frac{r}{R} = \frac{2-\sqrt{2}}{\sqrt{2}} = \sqrt{2}-1$

30. $a=12 \quad b=20 \quad c=16$

$\alpha = 30° \quad p = \frac{12+20+16}{2} = 24$

$V = \frac{1}{3} \cdot 12 \cdot 4 \cdot 8 \cdot \frac{\sqrt{3}}{2} = \frac{128\sqrt{3}}{3}$ (A)

27.



$\frac{360°}{36°} = 10$ (B)

28. $M(-4;1)$

$y = -\frac{5}{6}x + b$

$1 = -\frac{5}{6}\cdot(-4) + b$

$1 - \frac{20}{6} = b$

$-\frac{14}{6} = b$

$y = -\frac{5}{6}x - \frac{14}{6}$

$5x + 6y + 14 = 0$ (D)

$\frac{x}{5} - \frac{y}{6} = 1$

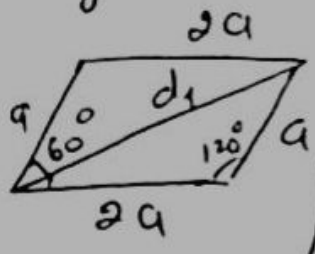
$y = \frac{6}{5}x - 1$

$k_1 \cdot k_2 = -1$

$\frac{6}{5} \cdot k_2 = -1$

$k_2 = -\frac{5}{6}$

29.



$\cos\alpha = \sqrt{\frac{67}{112}} \qquad \sin\alpha = \frac{3\sqrt{35}}{28}$

$\sin\beta = \frac{d_1 \sin\alpha}{d_2}$ { $\frac{H}{d_1} = \sin\alpha$; $\frac{H}{d_2} = \sin\beta$ }

$d_1^2 = a^2 + 4a^2 + 2\cdot a \cdot 2a \cdot \frac{1}{2}$

$d_1 = \sqrt{7}a$

$d_2^2 = a^2 + 4a^2 - 2a \cdot 2a \cdot \frac{1}{2}$ (C)

$d_2 = \sqrt{3}a$

$\sin\beta = \frac{\sqrt{7}\cdot\frac{3\sqrt{35}}{28}}{\sqrt{3}} = \frac{\sqrt{15}}{4} \qquad \cos\beta = \frac{1}{4}$