

@matematika09 kanallarinix @alphraganus

Variant-19.

1. $x:37=1827$.
 $x=1827:37$. (D)
 $1827:37:29=2331$

2. $\frac{4}{7x} = -\frac{3}{4y} = \frac{5}{8z}$ $y < 0$.

(C) $32z = 35x \cdot y$ $x < z$

3. $a^4 + 4b^4 = p$.

(C) $a=1$ $b=1$ $1+1=2$.

4. $\frac{x^3+27}{2x-2} \cdot \frac{x^2-1}{x^2+4x+3} \cdot \frac{6x+12}{3x^2-9x+2}$ $(x+2)$

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

5. $\sqrt{ab} = a+6$ $ab = a^2 + 12a + 36$
 $\frac{a+b}{2} = b-7$ $a+b = 2b-14$ $a = b-14$

(A) $a \cdot (a+14) = a^2 + 12a + 36$ $a = 18$ $b = 32$

6. $(k-3)^6 + (x^2-2x-1)^3 = 0$

$(x-3)^6 = -(x^2-2x-1)^3$
 $(x-3)^2 = -(x^2-2x-1)$ (B)

$x^2-6x+9 = -x^2+2x+1$

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

$x^2-4x+4 = 0$ $x_1+x_2 = 4$

7. $|x^2-25| + |3x+15| = 0$

$\begin{cases} x^2-25=0 \\ 3x+15=0 \end{cases} \Rightarrow \begin{cases} x=\pm 5 \\ x=-5 \end{cases} \Rightarrow x=-5$ (D)

8. $x^2 + (k+2)x + 2k-4 = 0$

$x_1 < 2$ $x_2 < 2$

$x_1-2 < 0$ $x_2-2 < 0$

$(x_1-2)(x_2-2) > 0$

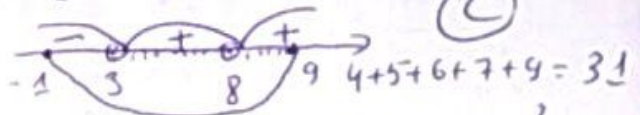
$x_1x_2 - 2(x_1+x_2) + 4 > 0$

$2k-4 - 2(k+2) + 4 > 0$

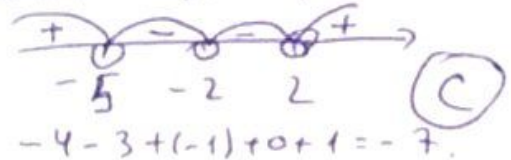
$k - k^2 - 4k - 4 > 0$

(C) $k^2 + 3k + 4 > 0$ $k \in \mathbb{R}$ $k = -1$

9. $\frac{(8-x)^2}{x-3} > 0$ $[-1; 9]$



10. $|x^2+7x+10| + |x^2-4| > |2x^2+7x+6|$
 $(x^2+7x+10)(x^2-4) < 0$



11. $b_1 + b_4 = 27$ $b_2 + b_3 = 72$

$b_1 b_2 b_3 b_4 = ?$

$q > 1$

$\begin{cases} b_1 + b_4 = 27 & b_1 = 3 \\ b_1 b_4 = 72 & b_4 = 24 \end{cases}$

$3 + 6 + 12 + 24 = 45$ (B)

$q = 2$ (B)

15. $y = |3x+2| + |2x-3|$

(A) $3x = -2$ $x = -\frac{2}{3}$

$|2 \cdot \frac{2}{3} + 3| = \frac{13}{3}$ $4, 13$

12. $\cos x^0 + \cos y^0 + \cos 135^0 + \cos 179^0 = 0$

$\cos x + \cos y = 0$ (C)

$x + y = 180^0$

13. $\arccos(\cos 2) = 2$ (A)

14. $\begin{cases} \lg \alpha + \lg \beta = 4 \\ \lg \alpha + \lg \beta = 2 \end{cases} \Rightarrow \begin{cases} \sin(\alpha+\beta) = 4 \cos \alpha \cos \beta \\ \sin(\alpha+\beta) = 2 \sin \alpha \sin \beta \end{cases}$

$0 = 2 \cos \alpha \cos \beta + \cos(\alpha+\beta)$ $\cos(\alpha+\beta) = -2 \cos \alpha \cos \beta$

$\lg(\alpha+\beta) = \frac{\sin(\alpha+\beta)}{\cos(\alpha+\beta)} = \frac{4 \cos \alpha \cos \beta}{-2 \cos \alpha \cos \beta} = -2$ (D)

(15)

16. $y = 6 \cos x$ $\lg x = 6 \sin x$

(B) $\cos x \neq 0 \Rightarrow \sin x \in \pm 1$ $(-6, 6)$

17. $[-3; 4]$ (D)

18. $2^a = 81$ $\lg_2 81 = a$ $a \cdot b = \lg_2 81 \cdot \lg_3 8$
 $3^b = 8$ $\lg_3 8 = b$ $a \cdot b = 12$ (B)

19. $3^{1+x} \cdot 2^{1-x} + 3^x \cdot 2^{-x} < 10,5$

$3^x \cdot 2^{-x} (3 \cdot 2 + 1) < 10,5$

$3^x \cdot 2^{-x} \cdot 7 < \frac{21}{2}$

$3^x \cdot 2^{-x} < \frac{3}{2} \quad 2^{-x-1} < 3^{1-x}$

$(\frac{3}{2})^x < \frac{3}{2} \quad x < 1 \quad x=0$ (B)

20. $\log_{\sqrt{10+3}} (\sqrt{7}-\sqrt{6}) = a$
 $\log_{\sqrt{7+\sqrt{6}}} (\sqrt{10}-3) = x$

$\log_{\sqrt{10+3}} (\sqrt{7}-\sqrt{6}) \cdot \log_{\sqrt{7+\sqrt{6}}} (\sqrt{10}-3) = a \cdot x$

$\log_{\sqrt{7+\sqrt{6}}} (\sqrt{7}-\sqrt{6}) \cdot \log_{\sqrt{10+3}} (\sqrt{10}-3) = a \cdot x$

$1 = a \cdot x \quad x = \frac{1}{a}$ (A)

21. $\sin x \cdot \log_3 x \cdot \sqrt{3-x} = 0$

$\sin x = 0 \quad \log_3 x = 0 \quad 3-x \geq 0 \quad x \leq 3$

$x=1 \quad x=3$ (D)

$[0; 3] \quad x=\pi n \quad x=\pi$

22. $y = x^3 - kx^2 + 4kx + 5$

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

(A) $4k^2 - 4 \cdot 4k \cdot 3 < 0$

$k=11 \quad 4k(k-12) < 0$

$(0; 12)$

23. $\int_1^2 (x + \frac{1}{x})^2 dx = \int_1^2 (x^2 + 2 + \frac{1}{x^2}) dx =$

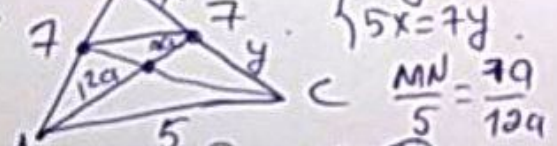
$= \frac{x^3}{3} + 2x - \frac{1}{x} \Big|_1^2 = \frac{29}{6}$ (A)

24. 1) 2) (C)

25. KOMBINATORIKA = 13 TA.
 $i = 2$ TA.

$\frac{2}{13}$ (C)

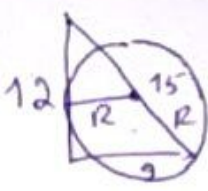
26. $\begin{cases} x+y=7 \\ 5x=7y \end{cases}$



$MN = \frac{35}{12} = 2 \frac{11}{12}$ (B)

27. $tgd = \frac{d_1}{d_2} = \frac{a}{a\sqrt{3}} \quad \alpha = 30^\circ \quad 2\alpha = 60^\circ \quad 120^\circ$

28. (A) $12 \quad \frac{9}{R} = \frac{15}{15-R} \quad R = \frac{45}{8}$



29. $-1 < a < 0 \quad 3 < b < 4$ (D)

30. $r = \frac{a}{2\sqrt{3}} = \frac{2\sqrt{3}}{2\sqrt{3}} = 1$



(A) $a = 2\sqrt{3} \quad H = 3 \quad H = 3$

$S_T = 2\pi r(r+H) = 2\pi \cdot 1(1+3) = 8\pi$

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Variant-20

1.
$$\begin{array}{r} abc \\ bca \\ cab \\ \hline 666 \end{array}$$

$a+b+c=6$ (A)

2.
$$\frac{1}{16} + \frac{2}{18} + \frac{3}{16} + \dots + \frac{15}{16} + \frac{16}{18} =$$

$$= \frac{1+3+\dots+15}{16} + \frac{2+4+\dots+16}{18} =$$

$$= \frac{\frac{1+15}{2} \cdot 8}{16} + \frac{\frac{2+16}{2} \cdot 8}{18} = 8$$
 (A)

3. $\frac{a+b}{a-b} = \sqrt{7}$ $\frac{a}{6} + \frac{b}{a} = ?$
 $\frac{1+\frac{b}{a}}{1-\frac{b}{a}} = \sqrt{7}$ $1+\frac{b}{a} = \sqrt{7} - \sqrt{7} \cdot \frac{b}{a}$
 $\frac{b}{a} = \frac{\sqrt{7}-1}{\sqrt{7}+1}$

$\frac{\sqrt{7}-1}{\sqrt{7}+1} + \frac{\sqrt{7}+1}{\sqrt{7}-1} = \frac{8}{3}$ (C)

4. $a = 18\sqrt{3}$
 $(\sqrt{a^3 \cdot 3^3} - \sqrt{27 \cdot a^3}) : (\frac{a^2+9}{3a} + 1)$

$\frac{(a-3)^{-1}}{(6a^3)^{-\frac{1}{2}}} - 6 =$
 1) $\sqrt{\frac{a^3}{27}} - \sqrt{\frac{27}{a^3}} = \frac{a^3-27}{\sqrt{27}a^3} = \frac{(a-3)(a^2+3a+9)}{3a\sqrt{3}a}$

2) $\frac{a^2+9+30}{3a}$ 1); 2) = $\frac{a-3}{\sqrt{3a}}$ (A)

3) $\frac{a-3}{\sqrt{3a}} \cdot \frac{1}{(a-3)} \cdot \frac{a\sqrt{6a}}{1} - 6 = \sqrt{2a} - 6 = 30$

5. $\frac{\sqrt{x}+\sqrt{y}}{\sqrt{x}-\sqrt{y}} = \frac{1}{\sqrt{x}-\sqrt{y}}$ (A)

6. $\begin{cases} x \cdot 2 + y \cdot 2 = \frac{5}{8} & x \cdot t = 1 \\ x \cdot 3 + y \cdot 2 = \frac{7}{8} & x = \frac{1}{4} \quad t = 4 \end{cases}$ (A)

7. $5x^3 - 10x^2 + x - 2 = 0$
 (D) $5x^2(x-2) + (x-2) = 0$ $(x-2)(5x^2+1) = 0$

8. $\begin{cases} y^2 = x^2 - 6x + 9 & y = x-3 & y = 3-x \\ x^2 + 2y = 2 & x^2 + 2(x-3) = 2 & x^2 + 2(3-x) = 2 \\ & x^2 + 2x - 8 = 0 & x^2 - 2x + 4 = 0 \end{cases}$
 4) a. $x^2 + 2x - 8 = 0$ $x^2 - 2x + 4 = 0$

9. $\sqrt{25-x^2} \leq \frac{12}{x}$ $25-x^2 \geq 0$
 [D] $1+2+3+4+5 = 15$ $[-5; 5]$ $x > 0$

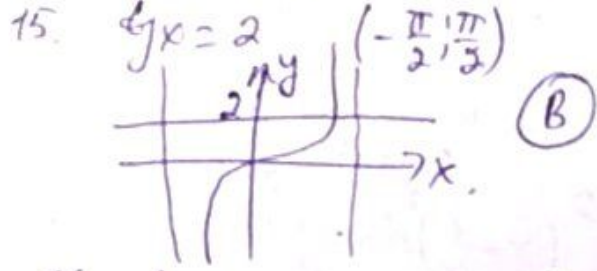
10. $-3x^2 + 9x + 0,25 < 0$ (C)
 $3x^2 - 9x + a - 0,25 > 0$ $a = 8$
 $D < 0$
 $81 - 12(a - 0,25) < 0$ $a > 7$

11. $x+x+1+x+2+x+3+x+4 = 100$
 $x = 18$ $x+4 = 22$ (A)

12. $(\cos^{-1} 3d + \text{ctg}(\frac{5\pi}{2} + 3d)) \cdot \text{ctg}(\frac{5\pi}{4} - \frac{3d}{2})$
 $(\frac{1}{\cos 3d} + \frac{\sin 3d}{\cos 3d}) \cdot \frac{1 + \text{ctg} \frac{3d}{2}}{1 - \text{ctg} \frac{3d}{2}} =$
 $= \frac{(\cos \frac{3}{2}d - \sin \frac{3}{2}d)^2}{(\cos \frac{3}{2}d)^2 - (\sin \frac{3}{2}d)^2} \cdot \frac{\cos \frac{3}{2}d + \sin \frac{3}{2}d}{\cos \frac{3}{2}d - \sin \frac{3}{2}d} = 1$ (A)

13. $(\text{tg} 5^\circ + \text{tg} 3^\circ) \cdot \text{ctg} 8^\circ + (\text{tg} 5^\circ - \text{tg} 3^\circ) \cdot \text{ctg} 2^\circ$
 $\frac{\sin 8^\circ}{\cos 5^\circ \cos 3^\circ} \cdot \frac{\cos 8^\circ}{\sin 8^\circ} + \frac{\sin 2^\circ}{\cos 5^\circ \cos 3^\circ} \cdot \frac{\cos 2^\circ}{\sin 2^\circ} = 1$ (A)

14. $\arcsin(\sin 10) = 3\pi - 10$ (A)



16. $f(x) = 7^{-x}$ $g(x) = 8^{-x}$ $h(x) = 9^{-x}$
 $f(44) = 7^{-44} = 2401^{-11}$
 $g(33) = 8^{-33} = 512^{-11}$
 $h(22) = 9^{-22} = 64^{-11}$
 $h(22) > g(33) > f(44)$ (A)

17. (B)
 18. $\begin{cases} x + y = 13 \\ x^2 - 11x - 12 = 0 \end{cases}$ $x = -1$ $x = 12$
 $12 = 12$ $y = 13$ (A)

19. (C)

$$20. \begin{cases} -2 < \log_{0.5} a < -1 \\ 1 < \log_{0.5} b < 3 \end{cases} \begin{cases} 2 < a < 4 \\ 0.5 > b > 0.5^3 \end{cases}$$

$$\frac{1}{4} < a < 2$$

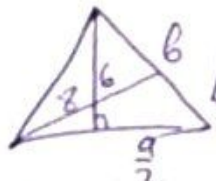
(A)

21. $f(x) = g(3x+2) \quad f'(3) = ?$
 $g'(11) = 12$
 $f'(x) = 3g'(3x+2)$ (A)
 $x=3 \quad f'(3) = 3 \cdot g'(11)$
 $f'(3) = 3 \cdot (-12) = -36$

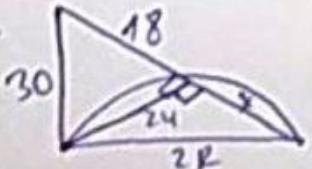
22. $\int_3^0 (3x-1) dx = 4 \quad \frac{3x^2}{2} - \frac{x}{1} = 4$
 $\frac{3a^2}{2} - a - \frac{27}{2} + 3 = 4$
 $a = \frac{1+2\sqrt{2}}{3}$ (A)

23. 1) 3) (A)

24. P. 7 = 56 (A)

25. 
 $a \cdot 6 = 8 \cdot b$
 $\frac{a^2}{4} + 36 = b^2$
 $a = \frac{24\sqrt{5}}{5} \quad b = \frac{18\sqrt{5}}{5}$
 $S = \frac{\frac{24\sqrt{5}}{5} \cdot 6}{2} = 14,4\sqrt{5}$ (C)

26. $P = 2a + 2b = 14 \quad a + b = 7 \quad a = 7 - b$
 $S = a \cdot b = a(7-a) = -a^2 + 7a \quad a = 3,5$
 $S'(a) = 0 \quad S = 3,5^2 = 12,25$ (B)

27. 
 $24^2 = 18 \cdot x \quad x = 32$
 $x^2 + 24^2 = (2R)^2 \quad R = 20$ (C)

28. $M(2;3) \quad 5x - 4y - 20 = 0 \quad y = \frac{5}{4}x - 5$
 $y = -\frac{4}{5}x + b$
 $3 = -\frac{4}{5} \cdot 2 + b$
 $b = \frac{23}{5}$
 $y = -\frac{4}{5}x + \frac{23}{5}$ (D)
 $4x + 5y - 23 = 0$

29. $\frac{d}{d} = \frac{a}{x} \quad x = \frac{a}{2}$

30. $60 \times 40 \times 5 \text{ cm} \quad 1 \text{ mm}$
 $600 \cdot 400 \cdot 50 = 120 \cdot 10^5 = 12 \cdot 10^6 \text{ mm}^3$
 12 m^3 (D)



Variant-21

1. $(2^2+6^2+10^2+14^2+18^2) - (1^2+5^2+9^2+13^2+17^2) =$
 $3+11+19+27+35 = 95$ (A)

2. $a=2-\sqrt{3}$ $b=2+\sqrt{3}$
 $a+b=4$ $a \cdot b=1$
 $a^3+b^3 = (a+b)^3 - 3ab(a+b)$
 (D) $64 - 12 = 52$

3. $\frac{x}{ax-2a^2} - \frac{2}{x^2+x-2ax-2a} \cdot (1 + \frac{3x+x^2}{3+x})$
 $= \frac{x}{a(x-2a)} - \frac{2}{x(x+1)-2a(x+1)} \cdot (1+x) =$
 $= \frac{x}{a(x-2a)} - \frac{2}{(x+1)(x-2a)} \cdot (1+x) = \frac{1}{a} = 4$ (B)

4. $a+b+c=2$ $ab+ac+bc=4$
 $a^3+b^3+c^3-3abc = ?$ $a+b=2-c$
 $(a+b)^3 = (2-c)^3$
 $a^3+3a^2b+3ab^2+b^3 = 8-12c+6c^2-c^3$
 $a^3+b^3+c^3 = 8-12c+6c^2-3ab(a+b)$
 $a^3+b^3+c^3 = 8-12c+6c^2-3ab(2-c)$
 $a^3+b^3+c^3 = 8-12c+6c^2-6ab+3abc$
 $a^3+b^3+c^3-3abc = 8-12c+6(c^2-ab)$
 $a+b=2-c$ $c(a+b)=4-ab$
 $c(2-c)=4-ab$ $2c-4=c^2-ab$
 $a^3+b^3+c^3-3abc = 8-12c+6(2c-4)$ (B)
 $a^3+b^3+c^3-3abc = 8-12c+12c-24 = -16$

5. $\sqrt{4^8+2 \cdot 6^8+9^8} - \sqrt{4^7+6^7+9^7} =$
 $= \sqrt{(2^8+3^8)^2} - \sqrt{(2^7+3^7)^2} = 2^8-2^7 = 2^7$ (D)

6. $\begin{cases} a_1 \cdot a_2 = 165 \\ a_2 \cdot a_3 = 285 \\ a_2(a_1+a_3) = 450 \end{cases}$
 $2a_2^2 = 450$ $a_2^2 = 225$ $a_2 = 15$
 $a_1 = 11$ $a_3 = 19$ (C)

7. $|x^2-2x-15| = 2x-x^2+15$
 (C) $x^2-2x-15 \leq 0$ $[-3, 5]$

8. $\sqrt{7-\sqrt{7+x}} = x$ $x > 0$ $x=2$

9. $(5-2x)^{10} < (-x^2-4x-7)^5$
 $(5-2x)^2 < (-x^2-4x-7)$
 $25-20x+4x^2 < -x^2-4x-7$
 $5x^2-16x+32 < 0$ \emptyset (D)

10. $(m-4)x^2-2x+m+1 > 0$
 $\begin{cases} m-4 > 0 \\ 4-4(m+1)(m-4) < 0 \end{cases}$ $(\frac{3+\sqrt{29}}{2}, \infty)$ (B)

11. $\begin{cases} b_5 - b_1 = 18 \\ b_5 - b_1 = 12 \end{cases}$ $\begin{cases} b_1(9^4-1) = 18 \\ b_1(9^2-1) = 12 \end{cases}$
 $9^2+1 = \frac{3}{2}$ $9^2 = \frac{1}{2}$ $b_1 = -24$
 $b_{11} = b_1 \cdot 9^{10} = -24 \cdot \frac{1}{32} = -\frac{3}{4}$ (D)

12. $(2 \cdot \frac{1}{\sin \alpha} + 2 \cot \alpha) \cdot (\frac{1}{\sin \alpha})^{\frac{1}{2}}$
 $= \frac{2}{\sin \alpha} + \frac{2 \cos \alpha}{\sin \alpha} = \frac{1+\cos \alpha}{\sin \alpha} =$
 $= \frac{2(1+\cos \alpha)}{\sin \alpha} \cdot \frac{1+\cos \alpha}{\sin \alpha} = 2 \cot \frac{\alpha}{2}$ (B)

13. $\cos 40^\circ + \cos 80^\circ - \cos 20^\circ =$
 $= 2 \cdot \cos 60^\circ \cdot \cos 20^\circ - \cos 20^\circ = 0$ (D)

14. $\sqrt{3} \sin x + \frac{3}{2} = 0$ $\sin x = -\frac{\sqrt{3}}{2}$
 $x = (-1)^{n+1} \frac{\pi}{3} + \pi n$
 $n=0$ $x = 0 - \frac{\pi}{3} = -\frac{\pi}{3}$ (D)

15. $f(x) = (\frac{1}{3})^{x^2-6x+11}$
 (B) $= (\frac{1}{3})^{(x-3)^2+2}$ $(0, \frac{1}{9}]$

16. (B)

17.
$$\begin{cases} 11^x + 8^y = 75 \\ 3 \cdot 11^x + 8^y = 97 \end{cases} \Rightarrow \textcircled{B}$$

$2 \cdot 11^x = 22 \Rightarrow 11^x = 11 \Rightarrow x = 1$
 $y = 2$

18. $\log_a b = -11 \Rightarrow \log_a \sqrt[3]{\frac{a}{b}} = \textcircled{C}$

$= \frac{1}{3} (1 - \log_a b) = \frac{1}{3} (1 + 11) = 4$

19. $y = \ln(3x^2 - 12x + 15) = \ln(3(x^2 - 4x + 4 + 1))$
 $= \ln(3((x-2)^2 + 1)) \quad \text{for } x \in \mathbb{R} \Rightarrow \textcircled{D}$

20. $\log_{0,2}^2(x+1) < 4 \Rightarrow \log_5^2(x+1) < 4$
 $(\log_5(x+1) - 2)(\log_5(x+1) + 2) < 0$
 $x = 24 \quad x = -\frac{24}{25} \quad \textcircled{C}$

21. $y = f(x)$ $(-2; 10)$ $(1; 10)$ $x_0 = -2$ $y_0 = 10$
 $f'(-2) = k \Rightarrow \textcircled{D}$
 $y = k(x - x_0) + y_0$
 $10 = k(1 + 2) + 10 \Rightarrow k = 0 \Rightarrow \textcircled{C}$

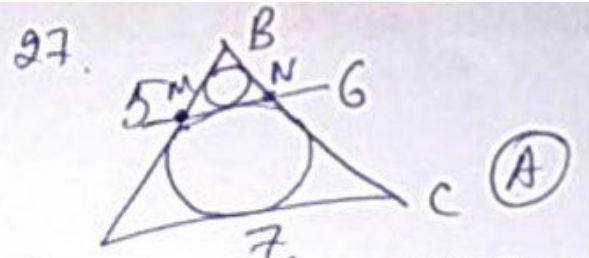
22. $\int_0^1 \frac{4}{3x+2} dx = \frac{4}{3} \ln|3x+2| \Big|_0^1 = \frac{4}{3} \ln 2,5$

23. 1) 3) \textcircled{D}

24. $7 \cdot 5 \cdot 4 = 140 \quad \textcircled{B}$

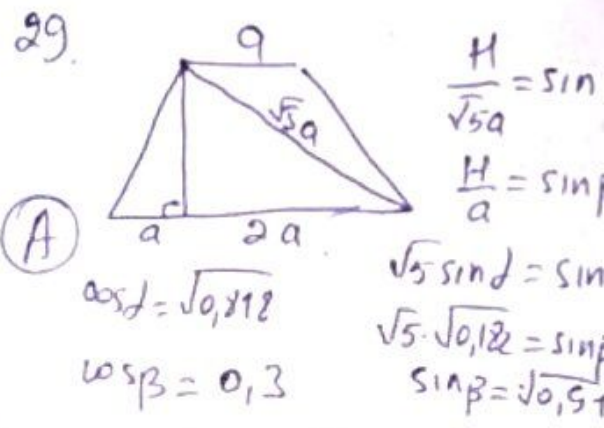
25.
 $\begin{cases} 2a = b \\ a^2 + b^2 = 50^2 \end{cases} \Rightarrow \textcircled{B}$
 $S = \frac{2a \cdot b}{2} = a^2 = 500$

26.
 $36; 54 \quad \textcircled{D}$



$\frac{r}{R} = \frac{P_{\text{inscribed}}}{P_{\text{triangle}}} = \frac{5+6+7}{5+6+7} = \frac{2}{9}$

28. $A(-2; 1) \quad B(a; -6)$
 $a = -2 \quad \textcircled{C}$



30. $V = \frac{1}{12} \cdot 12 \cdot 12 \cdot 12 \sqrt{3} = 144 \sqrt{3}$
 $V = \frac{1}{12} abc \sin \gamma \Rightarrow \textcircled{B}$



Variant-22

1. $a = 6a_1 + 2$
 $a = 6 \cdot b_1 + 4$ (C)
 $a + b = 6(a_1 + b_1 + 1)$

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8. $x^2 - 6x + 3 = 0$ $x^2 + \frac{9}{x^2} = ?$
 $x^2 + 3 = 6x$
 $x + \frac{3}{x} = 6$ $x^2 + 2 \cdot x \cdot \frac{3}{x} + \frac{9}{x^2} = 36$
 $x^2 + \frac{9}{x^2} = 30$ (A)

9. $x < -1$ $y > 1$ $y^5 > x^3$ (A)

10. $x + 4 < \sqrt{x + 46}$
 $x + 48 - 42 < \sqrt{x + 46}$
 $a^2 - a - 42 < 0$
 $(a + 6)(a - 7) < 0$
 $a < 7$ $\sqrt{x + 46} < 7$
 $\begin{cases} x + 46 < 49 & x < 3 \\ x + 46 \geq 0 & x \geq -46 \end{cases}$ (B)

11. $\begin{cases} a + \sqrt{a} \\ a - \sqrt{a} \end{cases} \Rightarrow \sqrt{a} \in \mathbb{N} = 1$
 $\begin{cases} a + \sqrt{a} \\ a - \sqrt{a} \end{cases} \Rightarrow \sqrt{a} \in \mathbb{N} = 0$

$1009 = 22 + 987$
 $22 \cdot 0 + 987 \cdot 1 = 987$ (D)

12. $a_{17} = 8a_{10}$ $S_{17} = ?$
(A) $a_{10} + 7d = 8a_{10}$ $d = a_{10}$
 $d = a_1 + 9d$ $a_1 = -8d$

$S_{17} = \frac{a_1 + a_{17}}{2} \cdot 17 = \frac{-8d + 8d}{2} \cdot 17 = 0$

13. $\frac{\sin 60^\circ}{\sin 20^\circ} - 2 \cos 40^\circ =$
(C) $\frac{\sin 60^\circ - 2 \cos 40^\circ \cdot \sin 20^\circ}{\sin 20^\circ} =$
 $\frac{\sin 60^\circ - 2 \cdot \frac{1}{2} (\sin 20^\circ + \sin 60^\circ)}{\sin 20^\circ} =$
 $\frac{\sin 60^\circ - \sin 20^\circ - \sin 60^\circ}{\sin 20^\circ} = 1$

14. $\frac{\log_{\cos} \left(\frac{4\sqrt{3}}{3} \right)}{\log_{\cos} \left(\frac{4\sqrt{3}}{3} \right)} + \frac{3 \cdot |3\sqrt{3} - 2\sqrt{7}|}{3\sqrt{3} - 2\sqrt{7}} +$
 $+ \frac{9 \cdot |\arccos(-0.5) - \frac{\pi}{2}|}{\arccos(-0.5) - \frac{\pi}{2}} = -1 + (-3) + 9 = 5$
(C)

2. $\frac{3}{7} = 0, (\overline{428571})$ (A)

$$\begin{array}{r} 2018 \overline{) 6} \\ 2016 \overline{) 336} \\ \hline 2 \end{array}$$

3. $\frac{a^4 - 10a^2 + 169}{a^2 + 6a + 13} = \frac{a^4 + 26a^2 + 169 - 36a^2}{a^2 + 6a + 13} =$
 $= \frac{(a^2 + 13)^2 - (6a)^2}{a^2 + 6a + 13} = \frac{(a^2 - 6a + 13)(a^2 + 6a + 13)}{a^2 + 6a + 13} =$
 $= a^2 - 6a + 13$ (C)

4. $a - b = \sqrt{x + 3}$ $a - b > 0$ $a > b$ (A)

5. $400 - 250 = 150$ $400 + 50 = 450$
(B)

6. $\left(\frac{x^2}{9} + \frac{16}{x^2} \right) - 2 \left(\frac{x}{3} - \frac{4}{x} \right) - \frac{19}{9} = 0$
 $\frac{x^2}{9} - \frac{4}{x} = a$ $\frac{x^2}{9} - 2 \cdot \frac{x}{3} \cdot \frac{4}{x} + \frac{16}{x^2} = a^2$
 $a^2 + \frac{8}{3} - 2a - \frac{19}{9} = 0$

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$a_1 = \frac{1}{3}$ $a_2 = \frac{5}{3}$
 $\frac{x}{3} - \frac{4}{x} = \frac{1}{3}$ $x_1 = -3$ $x_2 = 4$ (A)
 $\frac{x}{3} - \frac{4}{x} = \frac{5}{3}$ $x^2 - 5x - 12 = 0$
 $-12 \cdot (-12) = 144$

7. $\sqrt{x} + \sqrt{4x} + \sqrt{16x} + \dots + \sqrt{4^{10}x} + 3 = \sqrt{x+1}$
 $x + \sqrt{4x} + \sqrt{16x} + \dots + \sqrt{4^{10}x} + 3 = x + 2\sqrt{x} + 1$
 $4x + \sqrt{16x} + \dots + \sqrt{4^{10}x} + 3 = 4x + 4\sqrt{x} + 1$
 $16x + \dots + \sqrt{4^{10}x} + 3 = 16x + 8\sqrt{x} + 1$
 $4^{10}x + 3 = 4^{10}x + 2^{10}\sqrt{x} + 1$
 $2 = 2^{10}\sqrt{x}$ $\sqrt{x} = 2^{-10}$
 $x = 2^{-20}$ (B)

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15. $\text{ctg}(\frac{\pi}{2}x - \pi) = 1$

$\text{ctg} \frac{\pi}{2}x = 1$ (A)

$\frac{\pi}{2}x = \frac{\pi}{4} + \pi n \quad x = \frac{1}{2} + 2n$

16. $y = (x+3)^{-\frac{6}{7}} = \frac{1}{\sqrt[7]{(x+3)^6}}$ $x+3 > 0$

$(-\infty; -3) \cup (-3; \infty)$ (D)

17. $\begin{cases} x \cdot 2^x - y \cdot 4^y = x \cdot 4^y - y \cdot 2^x \\ 3^x \cdot 9^y = 81 \end{cases}$

$\begin{cases} (x+y) \cdot 2^x = (x+y) \cdot 4^y \\ 3^x \cdot 3^{2y} = 3^4 \end{cases}$

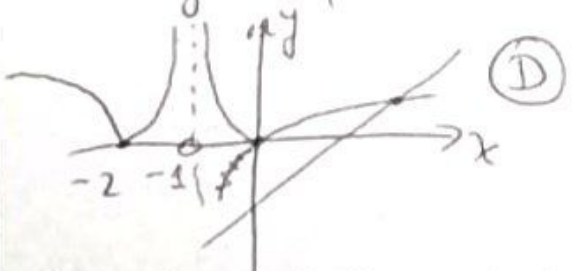
$\begin{cases} (x+y)(2^x - 2^{2y}) = 0 \\ 3^{x+2y} = 3^4 \end{cases}$ (C)

$\begin{cases} x+y=0 \\ x+2y=4 \end{cases} \Rightarrow \begin{cases} x=2y \\ x+2y=4 \end{cases}$
 $(-4; 4) \quad (2; 1)$

18. $\log_a b = x$ (B)

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

19. $|\lg|x+1|| = x-3$



20. $f(x) = |x^2 - 2x - 3| \div |x+2|$

$f'(0) = ?$ (D)

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

$f'(x) = -2x + 1 \quad f'(0) = 1$

21. $y = 4x^5 - 15x^4 - 5$ $(-1; 1)$

$y' = 20x^4 - 60x^3 = 0 \quad y(0) = -5$

$20x^3(x-3) = 0 \quad y(3) = 4 \cdot 3^5 - 5 \cdot 3^5 - 5$

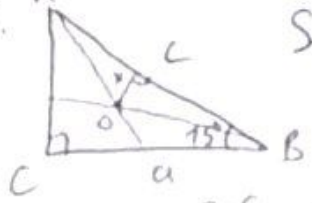
$x=0 \quad x=3$ (C)

22. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \cos(3x - \frac{\pi}{4}) dx = \frac{1}{3} \sin(3x - \frac{\pi}{4}) \Big|_{\frac{\pi}{4}}^{\frac{\pi}{2}} = \frac{\sqrt{2}}{6} - \frac{1}{3}$ (D)

23. (D)

24. $A_9^3 = \frac{9!}{6!} = 7 \cdot 8 \cdot 9 = 504$ (B)

25. $S = 9$



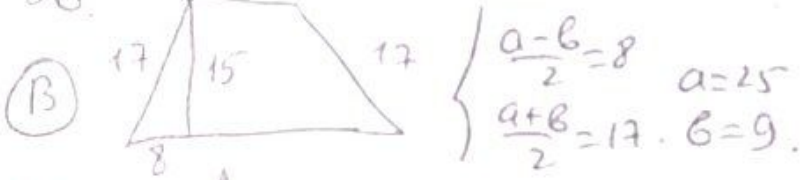
$S_{AOB} = \frac{c \cdot x}{2} = 3$

$\sin 15^\circ \frac{a \cdot c}{2} = 9 \quad 2 \cdot \frac{c^2}{2} \sin 15^\circ \cos 15^\circ = 9 \cdot 2$

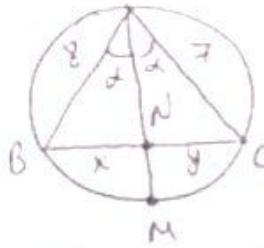
$a = c \cos 15^\circ \quad \frac{c^2}{2} \cdot \frac{1}{3} = 18$

$\frac{c \cdot x}{2} = 3 \quad \frac{6\sqrt{2} \cdot x}{2} = 3 \quad c = \sqrt{72} = 6\sqrt{2}$
 $x = \frac{\sqrt{2}}{2}$ (D)

26.



27.



$\begin{cases} x+y=9 \\ 2y=7x \end{cases} \Rightarrow \begin{cases} x-y=3 \\ x-y=21/5 \end{cases}$
 $x = \frac{24}{5} \quad y = \frac{21}{5}$ (B)

28. $A(4; 2) \quad B(6; -5) \quad C(-5; 4) \quad D(x; y)$

$\overline{AC}(-9; 2) \quad \overline{BD}(x-6; y+5)$
 $\overline{AC} \cdot \overline{BD} = 0 \quad -9(x-6) + 2(y+5) = 0$
 $9x - 2y - 64 = 0$

29. $A(2; 3; 5) \quad B(-1; 3; 4) \quad C(x; 0; 0)$
 $AC = BC$
 $(x-2)^2 + 3^2 + 5^2 = (x+1)^2 + 3^2 + 4^2 \quad x=2$ (B)

30. $50! : 5 = 10 \quad 10^3 = 1000$ (B)

