

MATH

1. Simplify $\left(\left(a^{-\frac{3}{2}} b \right) (ab^{-2})^{-\frac{1}{2}} (a^{-1})^{-\frac{2}{3}} \right)^{\frac{5}{2}}$

- A) $\frac{b^{\frac{4}{3}}}{a^4}$
 B) $\frac{b^{\frac{3}{3}}}{a}$
 C) $\frac{b^{\frac{2}{3}}}{a}$
 D) $\frac{b^5}{\frac{10}{a^3}}$

2. Solve the equation $(0, 25)^{2-x} = \frac{1}{2^{x+3}}$

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

3. Given that $\sqrt{13+z^3} - \sqrt{z^3-14} = 3.375$, find the value of $\sqrt{13+z^3} + \sqrt{z^3-14}$.

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

4. The volume of the right prism is equal to 28, and the volume of the inscribed sphere is $10\frac{2}{3}\pi$. Find the base area of the right prism.

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

5. In a triangle ABC , points K and N are located on the AB and AC sides respectively. $AK : AB = 1 : 3$ and $AN : AC = 2 : 3$. ABC triangle has an area of 9. Find the area of AKN triangle.

- A) 9 B) 4 C) 2 D) 6

6. If $\log_{12} 2 = a$, find $\log_6 16$?

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

7. Find the derivative of the function

$$y = \arcsin x + \sin x + x^3$$

A) $y' = \frac{1}{\sqrt{1-x^2}} + \cos x - 3x^2$

B) $y' = \frac{1}{\sqrt{1-x^2}} - \cos x + 3x^2$

C) $y' = \frac{1}{\sqrt{1-x^2}} + \cos x + 3x^2$

D) $y' = \frac{1}{\sqrt{1-x^2}} - \cos x - 3x^2$

8. The side of the equilateral hexagon is $\sqrt{6}$. Find side of the equilateral triangle whose area is equal to the given hexagon.

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

9. Given that $\frac{dy}{dx} = 3x^2 - \frac{2-3x}{x^3}$, $x \neq 0$ and $y = 5$ when $x = 1$, find y in terms of x .

A) $y = x^3 + x^{-2} - 3x^{-1} + 6$

B) $y = x^3 + x^{-2} - x^{-1} + 4$

C) $y = x^3 + 2x^{-2} - x^{-1} + 3$

D) $y = 3x^3 + x^{-2} - x^{-1} + 2$

10. If the given arithmetic progression is $a_1 = 1, a_5 = 5 + x$ and $a_{15} = 10 + 3x$, find value of a_{39} .

- A) 60 B) 55 C) -56 D) 56

11. Evaluate: $\frac{2}{5 \cdot 7} + \frac{2}{7 \cdot 9} + \frac{2}{9 \cdot 11} + \dots + \frac{2}{73 \cdot 75}$

- A) $\frac{14}{75}$ B) $\frac{8}{75}$ C) $\frac{17}{75}$ D) $\frac{4}{75}$

12. $(\pi - 2, 75)^{\ln(\cos^4 x - \sin^4 x)} \geq 1$ Find the solutions, which belong to $[0; \pi]$.

A) $[0; \frac{\pi}{2}] \cup [\frac{3\pi}{2}; 2\pi]$

B) $[\frac{\pi}{4}; \frac{\pi}{2}] \cup (\frac{3\pi}{2}; 2\pi]$

C) $[0; \frac{\pi}{2}] \cup (\frac{3\pi}{2}; 2\pi]$

D) $[0; \frac{\pi}{4}] \cup (\frac{3\pi}{4}; \pi]$

13. $ABCD$ right rectangle is divided into two ABC and ACD triangles through AC diagonal. When $AB = 3$ and $AD = 4$, find the distance in between the centers of the circles inscribed into ABC and ACD triangles.

- A) 4 B) $\sqrt{5}$ C) 6 D) $2\sqrt{5}$

14. $(\pi - e)^{\ln(\cos^4 x - \sin^4 x)} \geq 1$ Find the solutions, which belong to $[0; \pi]$.
- A) $[0; \frac{\pi}{2}] \cup [\frac{3\pi}{2}; 2\pi]$
 B) $[\frac{\pi}{4}; \frac{\pi}{2}] \cup (\frac{3\pi}{2}; 2\pi]$
 C) $[0; \frac{\pi}{2}] \cup (\frac{3\pi}{2}; 2\pi]$
 D) $[0; \frac{\pi}{4}] \cup [\frac{3\pi}{4}; \pi]$
15. The height of the triangular prism is 7 units; the triangles, which both contain right angles, have cathetus, which are 3 and 4 units long. Calculate the volume of the figure.
 A) 21 B) 28 C) 12 D) 42
16. Find the range of the function $f(x) = \frac{4}{x - 5}$.
- A) $(-\infty; 4) \cup (4; +\infty)$
 B) $(-\infty; +\infty)$
 C) $(-\infty; 0) \cup (0; +\infty)$
 D) $(-\infty; 5) \cup (5; +\infty)$
17. Find the unknown number of which 6% is equal to the 22% of the 30.
 A) 110 B) 96 C) 90 D) 108
18. Solve the equation $2,8x - 3(2x - 1) = 2,8 - 3,19x$
 A) 19 B) 30 C) 27 D) 20
19. If $f(x + 1) = x^2 - 3x + 2$, find $f(x)$.
 A) $x^2 - 3x - 1$ B) $x^2 - 5x + 1$ C) $x^2 - 5x + 6$
 D) $x^2 - 4$
20. Evaluate: $\frac{400 - 21,5 \cdot 18,5}{1,5 \cdot 2\frac{1}{5} + 2,8 \cdot 1\frac{1}{2}}$
 A) $\frac{3}{10}$ B) $\frac{1}{5}$ C) $\frac{1}{4}$ D) $\frac{2}{3}$