



1. Solve the equation:

$$\frac{9}{x^3 - 1} - \frac{1}{x - 1} = \frac{2}{x^2 + x + 1}$$

2. Calculate: $(x^5 - 3x^3 + 2x^2 - 1) : (x^2 + 3x + 7) =$

3. Simplify: $\left(\frac{2x^{-1}y^5z^4}{3x^4y^{-2}z^{-2}}\right)^{-2} =$

4. Solve the following equation and inequalities:

a) $\sqrt{x+2} + \sqrt{x-2} = \sqrt{2x+3}$

b) $\sqrt{2x-1} < x-2$

c) $\sqrt{5-x^2} > x-1$

5. Solve these inequalities - graph the solutions:

a) $|x+2y| \leq 1$ **and** $|x-2y| \leq 1$

b) $|y-x| > 2$ **or** $|x-y| > 2$

6. Find the domains of these functions:

a) $\sqrt[8]{\frac{x-1}{x+3}}$ b) $\sqrt[5]{1+\frac{x}{x+4}}$ c) $\log_2 \frac{x^2-5x+6}{x+1}$

7. Solve this system of linear equations by using: *) method of elimination; *) method of substitution:

$$\begin{aligned} 2x - y + z &= -3 \\ x + y - z &= 6 \\ 3x - y - z &= 4 \end{aligned}$$

8. Perform the indicated operations:

$$\frac{3x^{2a} - 11x^a + 6}{x^{2a} - 6x^a + 9} \div \frac{9x^{2a} - 12x^a + 4}{x^{2a} - 5x^a + 6}$$

9. Solve the following exponential equation and inequality:

a) $\left(\frac{2}{3}\right)^{|x^2+2x-19|} = \frac{65536}{43046721}$

b) $2^x + 4^x > 6$

10. Solve the following logarithmic equation and inequalities:

a) $2 \log_5(x^2 + 4x + 3) - \log_5(x^2 + 4x + 3) - \frac{\log_{13}(x+1)}{\log_{13} 5} = 9^{\log_9 2}$

b) $\frac{1}{\log_4\left(\frac{x+1}{x+2}\right)} < \frac{1}{\log_4(x+3)}$

c) $\log_{0.2} \log_6 \frac{x^2 - x}{x^2 + 1}$

11. Two points (-1, 3) and (6, 1) on line l_1 and two points (10, -3) and (2, 12) on line l_2 are given. Find the equations of these two lines and draw the conclusion about whether they are: a) parallel, b) perpendicular, or c) neither.

12. Simplify this fraction:

$$\frac{1}{1 + \frac{1}{1 + \frac{1}{1 + \frac{1}{x}}}}$$

13. Solve this quadratic equation: $3x^2 + 2x + 3 = 0$

14. a) Find the number of terms in this series $6 + 9 + 12 + 15 + \dots + 93$ and then find the sum.

b) Find the indicated sum: $\sum_{k=1}^{10} 2^k$

15. Calculate the following basic arithmetic operations of complex numbers:

a) $(6 - \sqrt{-8}) - (4 + \sqrt{-18})$ b) $\frac{6 - 5i}{2 - i}$



16. Solve this equation: $\sin x = \cos 2x$

17. Calculate: a) $\lim_{x \rightarrow \infty} \frac{5x^3 - 7x}{2x^2 + 3}$ b) $\lim_{x \rightarrow \infty} \frac{x^2}{e^x}$

18. Find the derivative of: $y = (x + \frac{1}{\sqrt{x}}) \cdot (x + 3)$

19. Find asymptote(s) of the following function: $y = x + \frac{25}{x}$

20. Calculate: a) $\int \frac{4x^{10} - 2x^4 + 15x^2}{x^3} dx$

b) $\int x^2 e^x dx$