

1. Solve for  $y$ :  $5(y - 12) = 15 - 3(y + 4)$

a)  $y = \frac{63}{8}$

b)  $y = -\frac{108}{7}$

c)  $y = \frac{31}{8}$

d)  $y = -\frac{16}{7}$

e)  $y = \frac{57}{8}$

2. What is the solution set of the equation  $x^4 - 6x^2 + 8 = 0$ ?

a)  $\{\sqrt{2}, -\sqrt{2}, 2, -2\}$

b)  $\{\sqrt{2}i, -\sqrt{2}i, 2, -2\}$

c)  $\{0, 1, -1\}$

d)  $\{0\}$

e)  $\{1\}$

3. What is the solution set of the equation  $\sqrt{3x + 18} - x = 0$ ?

a)  $\{-3, 6\}$

b)  $\{6\}$

c)  $\{-9\}$

d)  $\{-6, -3\}$

e) There is no real solution

4. Solve for  $x$ :  $|2x + 4| \geq 2$ .

a)  $(-\infty, -1)$

b)  $(-\infty, -3] \cup [-1, \infty)$

c)  $(-\infty, 1] \cup [3, \infty)$

d)  $(-1, \infty)$

e)  $(-\infty, -3] \cup [3, \infty)$

5. Solve the polynomial inequality:  $3x^3 + x^2 - 27x < 9$ .

a)  $(-\infty, 3]$

b)  $(-\infty, -3) \cup \left(-\frac{1}{3}, 3\right)$

c)  $(-\infty, -3) \cup (-1, \infty)$

d)  $\left(-3, -\frac{1}{3}\right) \cup (3, \infty)$

e)  $(-3, -1) \cup (3, \infty)$

6. If

$$f(x) = \begin{cases} x^2 & \text{if } x \leq 0; \\ -x & \text{if } 0 < x \leq 2; \\ 1 & \text{if } x > 2, \end{cases}$$

find  $(f \circ f)(3)$ .

a)  $-1$

b)  $0$

c)  $9$

d)  $3$

e)  $1$

7. Suppose you start with the graph of  $f(x) = |x|$  and apply the following transformations in order:

- (1) Shift 3 units right,
- (2) Reflect across the  $x$ -axis,
- (3) Shift 2 units up.

You will obtain the graph of which function?

a)  $g(x) = -|x + 3| + 2$

b)  $g(x) = -|x + 3| - 2$

c)  $g(x) = -|x - 3| + 2$

d)  $g(x) = |-x - 3| + 2$

e)  $g(x) = |-x + 3| - 2$

8. Find the inverse function of  $f(x) = (x + 2)^3 - 8$ .

a)  $f^{-1}(x) = \sqrt[3]{x + 10}$

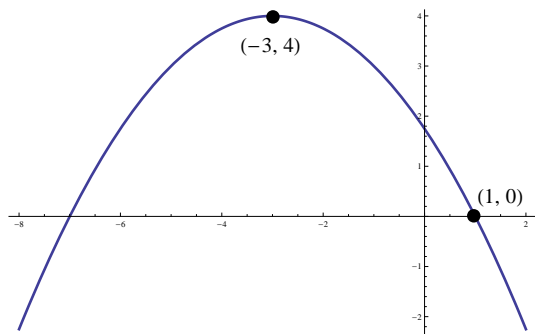
b)  $f^{-1}(x) = \sqrt[3]{x + 6}$

c)  $f^{-1}(x) = \sqrt[3]{x - 2} + 8$

d)  $f^{-1}(x) = \sqrt[3]{x + 8} - 2$

e)  $f^{-1}(x) = \sqrt[3]{x + 2} - 6$

9. Which function is represented by the graph below?



- a)  $f(x) = 4(x - 3)^2 - 4$
- b)  $f(x) = -4(x + 3)^2 + 4$
- c)  $f(x) = -\frac{1}{2}(x - 3)^2 + 4$
- d)  $f(x) = -\frac{1}{4}(x + 3)^2 + 4$
- e)  $f(x) = -\frac{1}{4}(x - 3)^2 + 4$

10. Find all the intercepts of the graph of  $f(x) = 2x^2 + 3x + 1$ .

- a)  $(-\frac{1}{2}, 0)$ ,  $(-1, 0)$ ,  $(0, 1)$
- b)  $(-1, 0)$ ,  $(0, 1)$
- c)  $(\frac{1}{2}, 0)$ ,  $(-2, 0)$ ,  $(0, 0)$
- d)  $(-\frac{1}{2}, 0)$ ,  $(-1, 0)$
- e)  $(0, 1)$

11. A toy rocket is shot vertically into the air from an initial height of 2 feet and an initial velocity of 96 feet per second. The height of the rocket in feet,  $t$  seconds after being launched is given by the function  $h(t) = -16t^2 + v_0t + h_0$  where  $v_0$  is the initial velocity and  $h_0$  is the initial height. What is the maximum height reached by the rocket?

- a) 3 feet
- b) 98 feet
- c) 146 feet
- d) 192 feet
- e) 242 feet

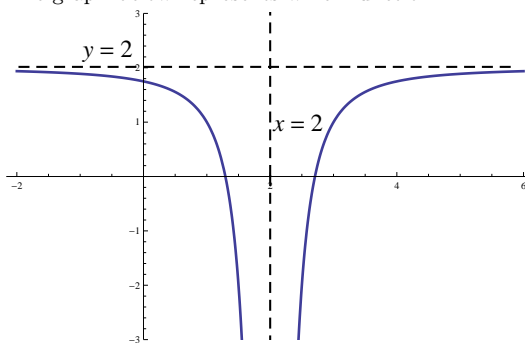
12. What is the remainder when  $f(x) = 2x^3 - 3x^2 - 6x + 10$  is divided by  $x - 1$ ?

- a) 3
- b) 4
- c) 5
- d) 6
- e) 7

13. The function  $f(x) = x^3 - 10x^2 + 32x - 32$  has a zero of multiplicity 1 at  $x = 2$ . Factor  $f(x)$  and determine which of the following statements is TRUE.

- a) The graph of  $f(x)$  touches the  $x$ -axis at  $x = 2$ .
- b) The graph of  $f(x)$  crosses the  $x$ -axis at  $x = -2$ .
- c) The graph of  $f(x)$  touches the  $x$ -axis at  $x = -2$ .
- d) The graph of  $f(x)$  crosses the  $x$ -axis at  $x = 4$ .
- e) The graph of  $f(x)$  touches the  $x$ -axis at  $x = 4$ .

14. The graph below represents which function?



- a)  $\frac{1}{(x - 2)^2} + 2$
- b)  $-\frac{1}{(x - 2)^2} + 2$
- c)  $\frac{1}{(x + 2)^2} + 2$
- d)  $\frac{1}{(x - 2)} + 2$
- e)  $-\frac{1}{(x - 2)} + 2$

15. Which of the following statements about the graph of  $\left(\frac{1}{3}\right)^x + 6$  is FALSE?

- a) The graph is decreasing on the interval  $(-\infty, \infty)$
- b) The domain is  $(-\infty, \infty)$
- c) The range is  $(6, \infty)$
- d) The  $y$ -intercept is  $y = 6$
- e) The horizontal asymptote is  $y = 6$

- a)  $(-\infty, 5) \cup (8, \infty)$
- b)  $(-\infty, -5) \cup (8, \infty)$
- c)  $(-5, 8)$
- d)  $(-\infty, -8)$
- e)  $(5, \infty)$

16. Solve the exponential equation  $125^x = \left(\frac{1}{25}\right)^{x-3}$ .

- a)  $x = \frac{6}{5}$
- b)  $x = \frac{5}{3}$
- c)  $x = \frac{3}{2}$
- d)  $x = -\frac{3}{5}$
- e)  $x = -6$

17. Solve  $\frac{\sqrt[3]{e^x}}{e^5} = \frac{1}{e}$ .

- a)  $x = 18$
- b)  $x = 15$
- c)  $x = 12$
- d)  $x = \frac{4}{3}$
- e)  $x = -\frac{4}{3}$

18. Evaluate  $\log_{\sqrt{5}} 25$ .

- a) 2
- b) 3
- c) 4
- d) 5
- e) 6

19. Find the vertical asymptote for the graph of  $f(x) = \log_2(x+1) - 2$ .

- a)  $x = -2$
- b)  $x = -1$
- c)  $x = 0$
- d)  $x = 1$
- e)  $y = 1$

20. Find the domain of  $f(x) = \ln\left(\frac{x+5}{x-8}\right)$ .

21. Write the expression  $2 \log u - 3 \log x - \frac{1}{2} \log z$  as a single logarithm.

- a)  $\log\left(\frac{u^2}{x^3\sqrt{z}}\right)$
- b)  $\log\left(\frac{u^2x^3}{\sqrt{z}}\right)$
- c)  $\log\left(\frac{u^2}{x^3z^2}\right)$
- d)  $\log\left(\frac{u}{xz}\right)$
- e)  $\log\left(\frac{x^3\sqrt{z}}{u^2}\right)$

22. Which of the following is equal to  $\log_{100} 5$ ?

- a)  $\frac{1}{2}$
- b)  $\frac{1}{2} \log 5$
- c)  $2 \log 5$
- d)  $-\log 5$
- e)  $\frac{\log 5}{\sqrt{10}}$

23. Solve for  $x$ :  $\log_2(3 - x^2) = 3$ .

- a)  $x = -1, x = 1$
- b)  $x = -5, x = 5$
- c)  $x = -\sqrt{5}, x = \sqrt{5}$
- d)  $x = 0$
- e) There is no solution

24. Solve for  $x$ :  $4(3^{2x+1}) = 64$ .

a)  $x = \frac{\ln 16 + \ln 3}{\ln 3}$

b)  $x = \ln 16 - \ln 3$

c)  $x = \frac{16 - \ln 3}{2 \ln 3}$

d)  $x = \frac{\ln 16 - \ln 3}{2}$

e)  $x = \frac{\ln 16 - \ln 3}{2 \ln 3}$

25. Solve for  $x$ :  $\log_4(2x - 3) = \log_4(x) + \log_4(x - 2)$ .

a)  $x = 1$

b)  $x = 1, x = 3$

c)  $x = 3$

d)  $x = 3, x = 6$

e)  $x = 6$

1. A
2. A
3. B
4. B
5. B
6. A
7. C
8. D
9. D
10. A
11. C
12. A
13. E
14. B
15. D
16. A
17. C
18. C
19. B
20. B
21. A
22. B
23. E
24. E
25. C