

1. Which of the following functions are odd?

$$f(x) = x^5 + 1$$

$$g(x) = x^3$$

$$h(x) = |x|$$

Possibilities:

- (a) Only $g(x)$ is odd.
 - (b) Only $g(x)$ and $h(x)$ are odd.
 - (c) Only $f(x)$ and $g(x)$ are odd.
 - (d) Only $h(x)$ is one-to-one.
 - (e) All of the functions are odd.
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2. Let $f(x) = |x + 4| - 5$. Find the average rate of change of $f(x)$ between $x = -8$ and $x = 8$.

Possibilities:

- (a) 8
 - (b) $-1/2$
 - (c) $1/2$
 - (d) 2
 - (e) -8
-

3. Find an equation for the line that is perpendicular to $y = \frac{6}{7}x + 5$ and contains the point $(0,13)$.

4. Solve.

$$\log_8(x - 5) + \log_8(x + 2) = 1$$

Possibilities:

- (a) $x_1 = 6$ and $x_2 = 3$
 - (b) $x_1 = 6$ and $x_2 = -3$
 - (c) $x_1 = 5$
 - (d) $x_1 = 5$ and $x_2 = -2$
 - (e) $x_1 = 6$
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5. Find the vertex of $y = 4x^2 - 40x + 102$.

6. Which of the following statements are true?

- (I) The graph of $P(x) = x^3 - 4x^2 + x + 6$ has an x -intercept at $(1, 0)$
- (II) The graph of $P(x) = x^3 - 4x^2 + x + 6$ has an x -intercept at $(-1, 0)$
- (III) $(x - 1)$ is a factor of $P(x) = x^3 - 4x^2 + x + 6$.
- (IV) $(x + 1)$ is a factor of $P(x) = x^3 - 4x^2 + x + 6$.

Possibilities:

- (a) Only (I) and (III) are true.
 - (b) Only (II) and (III) are true.
 - (c) Only (I) and (IV) are true.
 - (d) Only (II) and (IV) are true.
 - (e) None of the statements are true.
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7. Does the graph of $y = 3x^2 + 12x - 5$ have a maximum or a minimum? What is it?

8. What quantity, x , of a 45% acid solution must be mixed with a 10% acid solution to produce 800 mL of a 23.125% solution?

Possibilities:

- (a) 200 mL
 - (b) 300 mL
 - (c) 700 mL
 - (d) 600 mL
 - (e) 500 mL
-

9. Find all real solutions or state that there are NONE.

$$\sqrt{x + 2} = x + 9.$$

10. Find all real solutions or state that there are NONE.

$$9e^{x-8} = 2.$$

11. Solve the equation for a .

$$4x - 16 = -2 + a.$$

12. Explain how the graph of $g(x) = (x + 5)^3 - 7$ is obtained from the graph of $f(x) = x^3$.

Possibilities:

- (a) Shift right 5 units and shift down 7 units.
 - (b) Shift left 7 units and shift down 5 units.
 - (c) Shift right 7 units and shift up 5 units.
 - (d) Shift right 5 units and shift up 7 units.
 - (e) Shift left 5 units and shift down 7 units.
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13. Find the slope of the line through the points $(1, 4)$ and $(-9, 4)$.

14. Express the equation in logarithmic form.

$$8^3 = 512$$

Possibilities:

- (a) $\log_8 512 = 3$
 - (b) $\log_8 3 = 512$
 - (c) $\log_3 512 = 8$
 - (d) $\log_3 8 = 512$
 - (e) $\log_{512} 3 = 8$
-

15. $A(8,-9)$ and $B(-6,-2)$ are the endpoints of a diameter of a circle. Find the center of the circle.

Possibilities:

- (a) $(-7, 7/2)$
 - (b) $(1, -11/2)$
 - (c) $(0, 7\sqrt{5})$
 - (d) $(7\sqrt{5}, 0)$
 - (e) $(7, -7/2)$
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16. Carol has \$4000. She invests x dollars at an interest rate of 4% and the rest of her money at an interest rate of 6%. After one year, the total interest earned on these investments is \$180.00. Which of the equations below would you solve to find x ?

Possibilities:

- (a) $\frac{x}{4} + \frac{4000 - x}{6} = 180.00$
(b) $4x + 6(4000 - x) = 180.00$
(c) $0.04x \times 0.06(4000 - x) = 180.00$
(d) $0.04x + 0.06(4000 - x) = 180.00$
(e) $\frac{x}{0.04} + \frac{4000 - x}{0.06} = 180.00$
-

17. Solve the inequality $x^2 - 5x - 15 \geq 9$. Write the solution set in interval notation.

Possibilities:

- (a) $(-\infty, -8] \cup [3, \infty)$
(b) $(-\infty, -3] \cup [8, \infty)$
(c) $[-3, 8]$
(d) $[9, \infty)$
(e) $(-\infty, 9]$
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18. Which of the following statements are true?

- (I) $2^{\log_2(5)} = 5$
(II) $\log\left(\frac{a}{b}\right) = \log(a) - \log(b)$ for all positive a and b .
(III) $\ln(a + b) = (\ln(a))(\ln(b))$ for all positive a and b .

Possibilities:

- (a) Only (III) is true.
(b) Only (I) and (III) are true.
(c) Only (I) is true.
(d) Only (I) and (II) are true.
(e) Statements (I), (II), and (III) are all true.
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19. Find a formula for the parabola with vertex $(-5, 6)$ and that passes through the point $(-4, 9)$.

20. A ball is thrown straight upward at an initial speed of 240 feet per second. From Physics, we know that the ball will reach a height of h feet after t seconds where h and t are related by the following formula:

$$h = -16t^2 + 240t.$$

In order to determine when the ball hits the ground, you need to:

Possibilities:

- (a) Find the positive h intercept of the graph of $h = -16t^2 + 240t$.
 - (b) Calculate the average rate of change of h with respect to t .
 - (c) Find the slope of a line.
 - (d) Find the positive t intercept of the graph of $h = -16t^2 + 240t$.
 - (e) Find the intervals where the graph of h is increasing and where it is decreasing.
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21. Let $f(x) = \frac{1}{\sqrt{x-2}}$. Find the domain of $f(x)$.

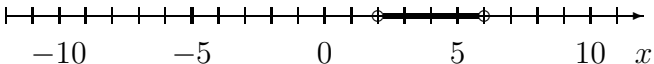
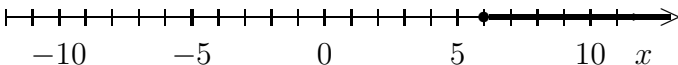
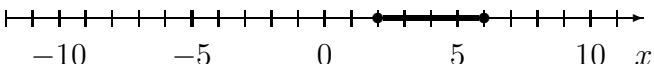
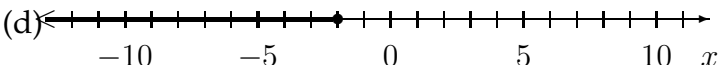
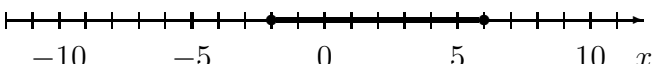
Possibilities:

- (a) $[2, \infty)$
 - (b) $(-2, \infty)$
 - (c) $(-\infty, 2]$
 - (d) $(2, \infty)$
 - (e) $(-\infty, -2)$
-

22. Solve the inequality and graph the solution set on the real number line.

$$|x - 2| \leq 4$$

Possibilities:

- (a) 
 - (b) 
 - (c) 
 - (d) 
 - (e) 
-

23. Let $f(x) = 2x + 7$. Find $f^{-1}(5)$.

Possibilities:

- (a) 6
- (b) 17
- (c) -2
- (d) 24
- (e) -1

24. Which of the following statements are true?

(I) If $P(x) = 3x^3 + x - 15x^2 - 5$, then $P(5) = 0$.

(II) $(5, 0)$ is an x -intercept on the graph of $y = 3x^3 + x - 15x^2 - 5$.

(III) The remainder of the division problem $\frac{3x^3 + x - 15x^2 - 5}{x - 5}$ is zero.

(IV) $(x - 5)$ is a factor of $3x^3 + x - 15x^2 - 5$.

Possibilities:

- (a) Only (III) and (VI) are true.
- (b) Only (I) and (III) are true.
- (c) (I), (II), (III), and (IV) are all true.
- (d) Only (I) and (II) are true.
- (e) None of the statements are true.

25. How many solutions are there for each equation?

(I) $(x - 2)^2 = 2$

(II) $(x + 5)^3 = 1$

Possibilities:

- (a) Equation (I) has no solutions, and equation (II) has no solutions.
 - (b) Equation (I) has no solutions, and equation (II) has 1 solution.
 - (c) Equation (I) has 2 solutions, and equation (II) has 1 solution.
 - (d) Equation (I) has 2 solutions, and equation (II) has 3 solutions.
 - (e) Equation (I) has 1 solution, and equation (II) has 3 solutions.
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26. Let $f(x) = \frac{x-3}{x-4}$. Find the x and y intercepts of the graph of $y = f(x)$.

Possibilities:

- (a) x -intercept: $(3, 0)$, y -intercept: $(0, 1)$
 - (b) x -intercept: $(1, 0)$, y -intercept: $(0, 3)$
 - (c) x -intercept: $(3, 0)$, y -intercept: $(0, 3/4)$
 - (d) x -intercept: $(1, 0)$, y -intercept: $(0, 1)$
 - (e) x -intercept: $(3/4, 0)$, y -intercept: $(0, 3)$
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27. Find the perimeter of the parallelogram ABCD with vertices A(1, 4), B(14, 4), C(17, 9), and D(4, 9).

Possibilities:

- (a) 36 units
 - (b) 65 units
 - (c) $65/2$ units
 - (d) 238 units
 - (e) $26 + 2\sqrt{34}$ units
-

28. If the GGMC corporation produces x kilograms of gadgets, then their revenue, in dollars, is given by $R(x) = 100 + 800x - .5x^2$. What is the maximum revenue and how many kilograms of gadgets should be manufactures to obtain this maximum?

Maximum Revenue: _____

Kilograms of Gadgets: _____

29. Let $f(x) = 3x + 2$. Find the average rate of change of $f(x)$ from $x = -5$ to $x = 9$.

Possibilities:

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

30. Solve.

$$\log_8(x - 5) + \log_8(x + 2) = 1$$

Possibilities:

(a) $x_1 = 6$ and $x_2 = -3$

(b) $x_1 = 6$ and $x_2 = 3$

(c) $x_1 = 5$ and $x_2 = -2$

(d) $x_1 = 5$

(e) $x_1 = 6$

31. If the GGMC corporation produces x kilograms of gadgets, then their revenue, in dollars, is given by $R(x) = 100 + 800x - .3x^2$. What is the maximum revenue and how many kilograms of gadgets should be manufactures to obtain this maximum?

Maximum Revenue: _____

Kilograms of Gadgets: _____

32. Find the quotient and the remainder of the division problem.

$$\frac{6x^3 + 3x^2 + 5x - 6}{x - 4}$$

33. Find all the solutions of the system of equations.

$$\begin{cases} -3x + y = 4 \\ x^2 - y = 14 \end{cases}$$

34. Which of the following functions are one-to-one?

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

$$g(x) = x^3$$

$$h(x) = 3x - 9$$

Possibilities:

- (a) Only $f(x)$ and $g(x)$ are one-to-one.
- (b) Only $g(x)$ and $h(x)$ are one-to-one.
- (c) Only $h(x)$ is one-to-one.
- (d) None of the functions are one-to-one.
- (e) All of the functions are one-to-one.

35. Find all real solutions or state that there are NONE.

$$-2x + 10 = 3x - 6.$$

36. Let $P(x) = 4x^3 + 56x^2 - 772x + 1288$. Decide which of the statements below are true.

- (I) $x = 2$ is a zero of $f(x)$.
- (II) $x = -2$ is a zero of $f(x)$.
- (III) $x + 2$ is a factor of $f(x)$.
- (IV) $x - 2$ is a factor of $f(x)$.
- (V) The graph of $y = P(x)$ has an x -intercept at $(2, 0)$.
- (VI) The graph of $y = P(x)$ has an x -intercept at $(-2, 0)$.

Possibilities:

- (a) (I) false; (II) false; (III) false; (IV) true; (V) false; (VI) true
- (b) (I) true; (II) false; (III) true; (IV) false; (V) true; (VI) false
- (c) (I) true; (II) false; (III) false; (IV) true; (V) true; (VI) false
- (d) (I) true; (II) true; (III) true; (IV) true; (V) true; (VI) true
- (e) (I) true; (II) false; (III) false; (IV) false; (V) false; (VI) false

37. Let $f(x) = -2x^7 + 2x^4 - 6x + 1$. Determine the end behavior of $y = f(x)$.

Possibilities:

- (a) $y \rightarrow 1$ as $x \rightarrow \infty$ and $y \rightarrow \infty$ as $x \rightarrow -\infty$
- (b) $y \rightarrow -\infty$ as $x \rightarrow \infty$ and $y \rightarrow 1$ as $x \rightarrow -\infty$
- (c) $y \rightarrow -\infty$ as $x \rightarrow \infty$ and $y \rightarrow -\infty$ as $x \rightarrow -\infty$
- (d) $y \rightarrow \infty$ as $x \rightarrow \infty$ and $y \rightarrow \infty$ as $x \rightarrow -\infty$
- (e) $y \rightarrow -\infty$ as $x \rightarrow \infty$ and $y \rightarrow \infty$ as $x \rightarrow -\infty$

38. Find the area of the triangle with vertices $A(-2, 3)$, $B(11, 3)$, and $C(3, 8)$.

Possibilities:

- (a) 65 square units
- (b) $13 + \sqrt{89} + 5\sqrt{2}$ square units
- (c) 66 square units
- (d) 72 square units
- (e) $65/2$ square units

39. The number of bacteria in a culture is modeled by the function $n(t) = 50e^{.45t}$ where t is measured in hours. After how many hours will the number of bacteria reach 3000?

Possibilities:

- (a) About 3.95 hours
- (b) About 10.02 hours
- (c) About 9.10 hours
- (d) About 49.05 hours
- (e) About 4.09 hours

40. Find the remainder of the division problem.

$$\frac{x^4 - 21x^3 + 153x^2 - 455x + 450}{x - 9}$$

Let $P(x) = x^4 - 21x^3 + 153x^2 - 455x + 450$. What is $P(9)$? What is the relationship between $P(9)$ and the remainder?

41. If \$3000 is invested at an interest rate of 8% per year compounded quarterly, find the amount of the investment at the end of 13 years.

Possibilities:

- (a) \$3247.30
- (b) \$4081.47
- (c) \$3880.82
- (d) \$8400.98
- (e) \$164118.12

42. How many solutions does the following system of equation have?

$$\begin{cases} 3x + 8y = 16 \\ 6x - 16y = 32 \end{cases}$$

Possibilities:

- (a) No solutions
- (b) One solution
- (c) Two solutions
- (d) Three solutions
- (e) Infinitely many solutions

43. Let $f(x) = 3x^2 + 5x$. Find $\frac{f(x+h) - f(x)}{h}$.

Possibilities:

- (a) $\frac{3h^2 + 5h}{h}$
- (b) $\frac{6xh + 3h^2 + 10x + 5h}{h}$
- (c) $6x + 3h + 5$
- (d) $-6x - 3h - 5$
- (e) $3h^2 + 5h$

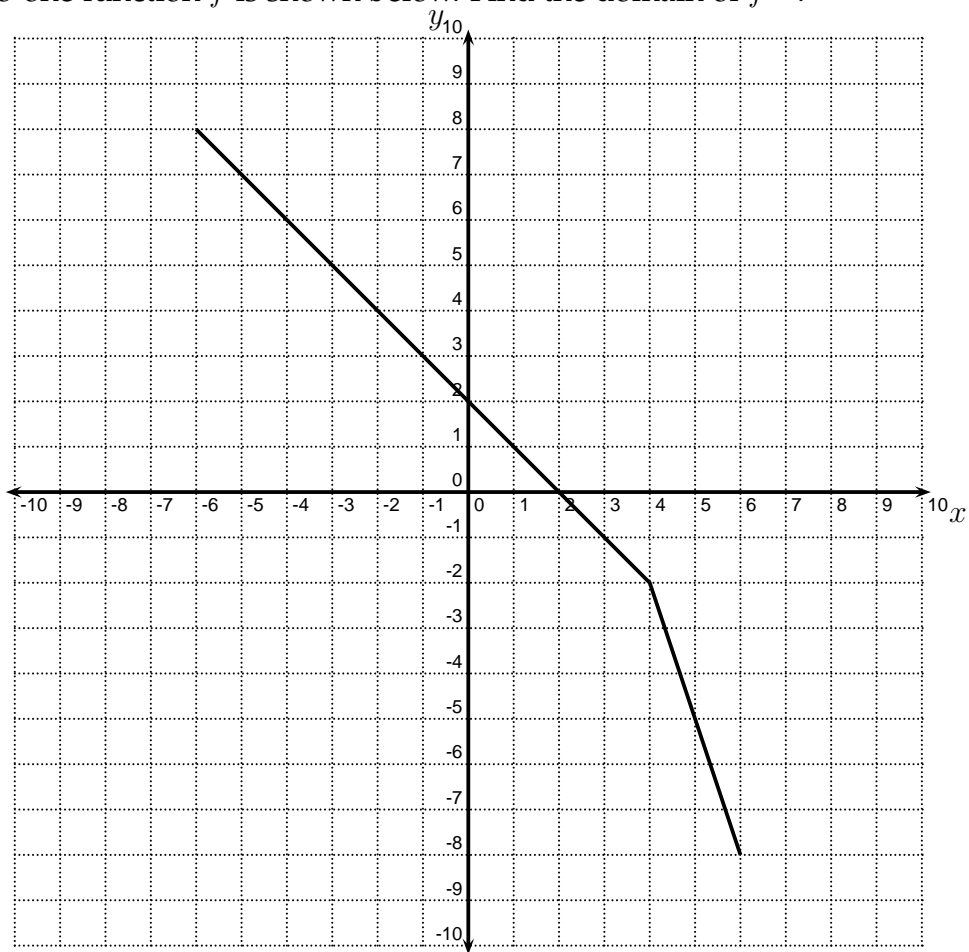
44. Suppose that the graph of $y = f(x)$ contains the point (5,3). Find a point on the graph of $y = 2f(x) - 4$.

45. Let $r(x) = \frac{x+1}{x^2-4}$. Find the horizontal asymptotes of $r(x)$.

Possibilities:

- (a) $r(x)$ does not have any horizontal asymptotes.
 - (b) $y = 1$
 - (c) $y = 0$
 - (d) $x = 2$ and $x = -2$
 - (e) $x = 1$
-

46. The graph of the one-to-one function f is shown below. Find the domain of f^{-1} .



47. Find the remainder of the division problem.

$$\frac{x^4 - 16x^3 + 71x^2 - 56x - 144}{x + 4}$$

Let $P(x) = x^4 - 16x^3 + 71x^2 - 56x - 144$. What is $P(-4)$? What is the relationship between $P(-4)$ and the remainder?

48. $\log\left(\frac{x^{-3}}{y^5 z^8}\right) =$

Possibilities:

- (a) $-3 \log(x) + 5 \log(y) - 8 \log(z)$
- (b) $-3 \log(x) / 5 \log(y) * 8 \log(z)$
- (c) $-3 \log(x) - 5 \log(y) + 8 \log(z)$
- (d) $-3 \log(x) - 5 \log(y) - 8 \log(z)$
- (e) $-3 \log(x) / (5 \log(y) * 8 \log(z))$

49. Let $f(x) = x^2 - 6x - 7$. Find the y -intercept(s) of the graph of $f(x)$.

Possibilities:

- (a) Both $(7, 0)$ and $(-1, 0)$
 - (b) Only $(0, -7)$
 - (c) Only $(-7, 0)$
 - (d) Both $(0, 7)$ and $(0, -1)$
 - (e) Both $(-7, 0)$ and $(1, 0)$
-

50. A ball is thrown straight upward at an initial speed of 200ft/sec. From Physics it is known that, after t seconds, the ball reaches a height h feet given by the formula

$$h = -16t^2 + 200t.$$

What is the maximum height reached by the ball?

Possibilities:

- (a) 677.30 ft
 - (b) 12.50 ft
 - (c) 625.00 ft
 - (d) 7.55 ft
 - (e) 6.25 ft
-

51. Find an equation for the line through the points $(-1, 5)$ and $(6, 13)$.

Possibilities:

- (a) $y - 13 = -\frac{7}{8}(x - 6)$
 - (b) $y - 5 = \frac{8}{7}(x + 1)$
 - (c) $y - 6 = \frac{8}{7}(x - 13)$
 - (d) $y + 5 = \frac{8}{7}(x - 1)$
 - (e) $y - 1 = -\frac{7}{8}(x - 5)$
-

52. Let $f(x) = \log_2(x + 7) - 3$. Find $f^{-1}(x)$.

53. You wish to purchase a new cell phone. You have a coupon for \$10 and the store is running a special which allows you to deduct 15% from the price. If the original price of the cell phone is 175 dollars, what is the final price if you apply the coupon and then apply the 15% discount.

54. Joni invests \$4000 at an interest rate of 6% per year compounded continuously. How much time will it take for the value of the investment to quadruple? Round your answer to the nearest tenth of a year.

Possibilities:

- (a) 24.0 years
- (b) 18.3 years
- (c) 11.6 years
- (d) 23.1 years
- (e) 26.8 years

55. Let $r(x) = \frac{x^2+6x-91}{x^2-9x+18}$. Find the vertical asymptotes of $r(x)$.

Possibilities:

- (a) $x = 7$ and $x = -13$
- (b) $y = 7$ and $y = -13$
- (c) $x = 3$ and $x = 6$
- (d) $y = 3$ and $y = 6$
- (e) $r(x)$ does not have any vertical asymptotes.

56. Let $P(x) = 8x^7 + 4x + 7$. List all possible rational zeros of $P(x)$ given by the Rational Zeros Theorem (but do not check to see which are actually zeros).

Possibilities:

- (a) $\pm 1, \pm 8, \pm 8/7$
- (b) $\pm 1, \pm 2, \pm 4, \pm 8, \pm 7, \pm 7/2, \pm 7/4, \pm 7/8$
- (c) $\pm 1, \pm 1/2, \pm 1/4, \pm 1/8, \pm 7, \pm 7/2, \pm 7/4, \pm 7/8$
- (d) $\pm 1, \pm 2, \pm 4, \pm 8, \pm 1/7, \pm 2/7, \pm 4/7, \pm 8/7$
- (e) $\pm 1, \pm 8, \pm 7/8$

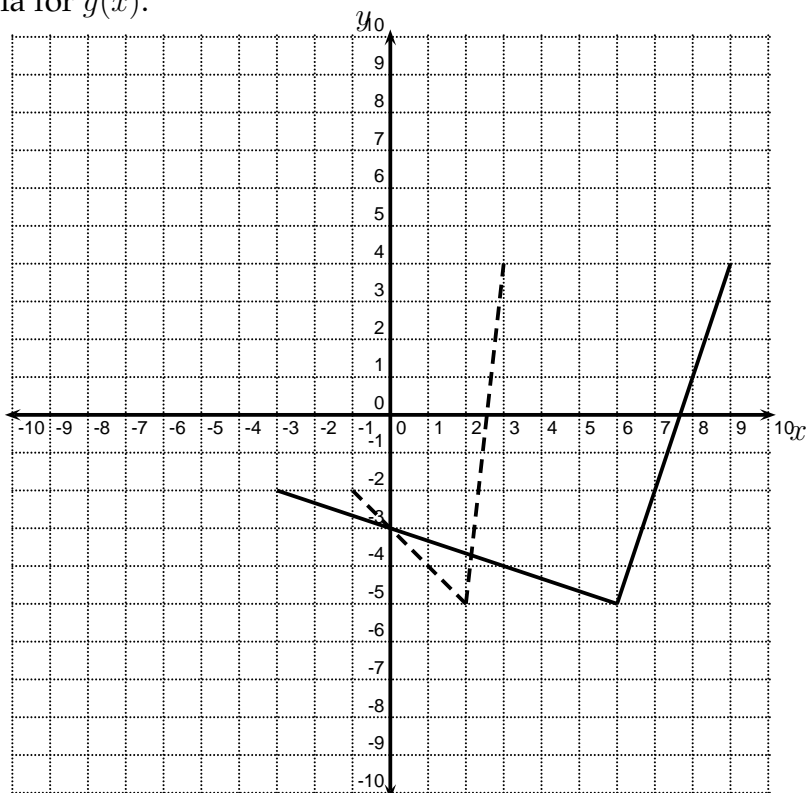
57. Let $f(x) = 2x^2 + 4x$. Find $f(x + 4)$.

Possibilities:

- (a) $2x^2 + 4x + 4$
- (b) $2x^2 + 5x + 4$
- (c) $2x^2 + 4x + 48$
- (d) $96x^2 + 192x$
- (e) $2x^2 + 20x + 48$

58. Let $f(x) = \frac{2x + 3}{4 - 5x}$. Find $f^{-1}(x)$.

59. In the picture below, the graph of $y = f(x)$ is the solid graph, and the graph of $y = g(x)$ is the dashed graph. Find a formula for $g(x)$.



Possibilities:

- (a) $g(x) = -3f(x)$
- (b) $g(x) = f\left(\frac{1}{3}x\right)$
- (c) $g(x) = 3f(x)$
- (d) $g(x) = \frac{1}{3}f(x)$
- (e) $g(x) = f(3x)$

60. Circle the even functions. Put a box around the odd functions.

- (a). $a(x) = |x|$
- (b). $b(x) = |x| + 1$
- (c). $c(x) = x^3$
- (d). $d(x) = x^3 + 1$
- (e). $e(x) = 5$
- (f). $f(x) = x^4$
- (g). $g(x) = x^4 + 1$
- (h). $h(x) = (x + 1)^4$
- (i). $i(x) = (x + 1)^3$
- (j). $j(x) = |x + 1|$
- (k). $k(x) = x$
- (l). $l(x) = \sqrt{x}$
- (m). $m(x) = \sqrt[3]{x}$
- (n). $n(x) = 0$

61.

$$f(x) = \begin{cases} x + 5 & \text{if } x \leq 2 \\ x - 5 & \text{if } x > 2 \end{cases}$$

Find $f(10)$.

Possibilities:

- (a) 15
 - (b) $\frac{15}{5}$
 - (c) 75
 - (d) 5
 - (e) Both 15 and 5.
-

62. Find all of the zeros of $P(x) = x^3 + 5x^2 + 4x$.

Possibilities:

- (a) 0,-1,4
 - (b) 0,-1,-4
 - (c) -1,-4,1
 - (d) -1,-4,3
 - (e) 0,1,4
-

63. Simplify.

$$(9x + 8)(2x - 5) - 16x - 64$$

Possibilities:

- (a) $18x^2 - 45x - 104$
 - (b) $18x^2 - 29x - 32$
 - (c) $18x - 48$
 - (d) $25x + 3$
 - (e) $18x^2 - 45x + 24$
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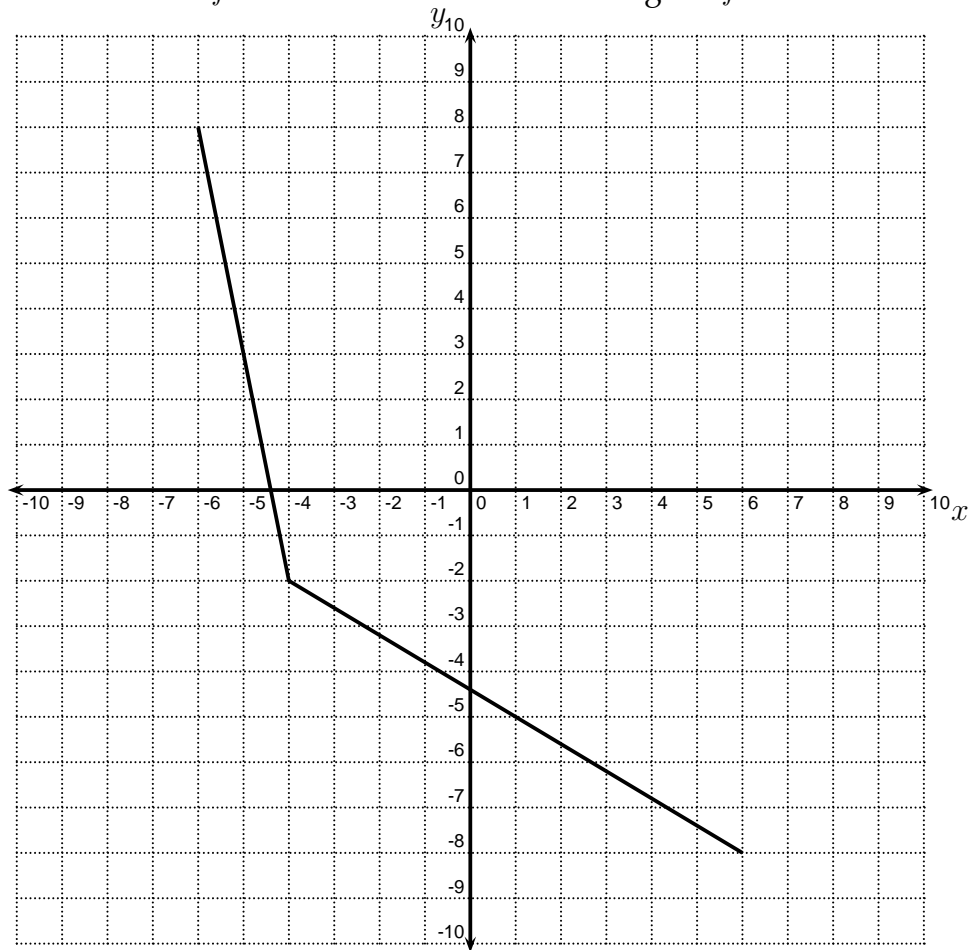
64. Find all real solutions or state that there are NONE.

$$x^2 - 7x + 13 = 3.$$

65. Find all real solutions or state that there are NONE.

$$\frac{3}{x+6} + \frac{7}{x+7} = \frac{5}{x^2 + 13x + 42}.$$

66. The graph of the one-to-one function f is shown below. Find the range of f^{-1} .



67. Solve.

$$\frac{9}{x} + \frac{4}{x-5} = 0$$

Possibilities:

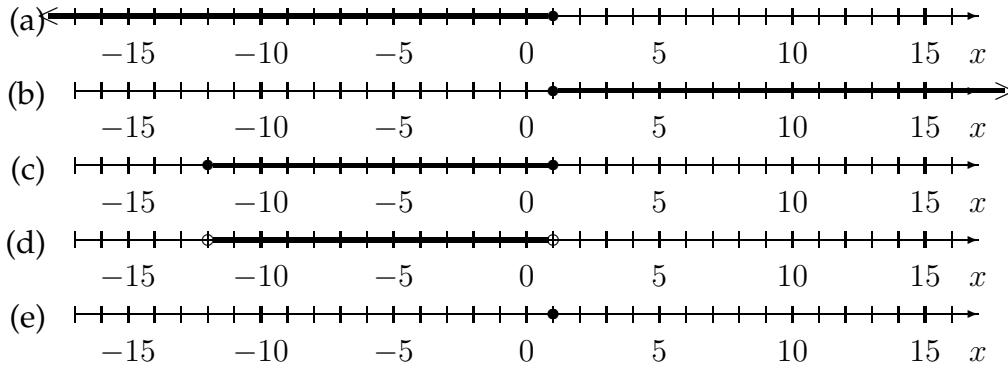
- (a) 9
- (b) $45/13$
- (c) $5/13$
- (d) $20/13$
- (e) 1

68. Find a polynomial of degree 3 that has zeros $-3, 3,$ and 6 and in which the coefficient of x^2 is -60 .

69. Solve the inequality and graph the solution set on the real number line.

$$|2x + 11| \leq 13$$

Possibilities:

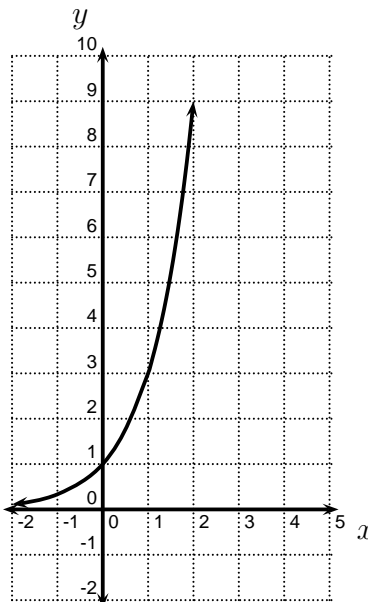


70. Find the vertex of the parabola given by $y = 3x^2 - 5x + 9$.

Possibilities:

- (a) $(-5/6, -83/12)$
- (b) $(5/6, 83/12)$
- (c) $(61/4, 5/6)$
- (d) $(83/12, 5/6)$
- (e) $(-5/6, 61/4)$

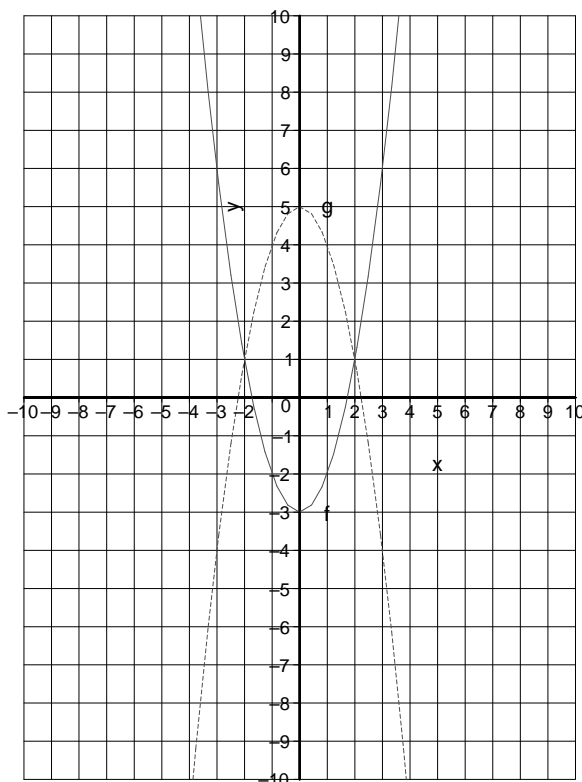
71. The graph of an exponential function, $f(x) = a^x$ is shown below. Find a .



Possibilities:

- (a) $\frac{1}{4}$
- (b) 3
- (c) $\frac{1}{3}$
- (d) 4
- (e) 2

-
72. In the graph below, the solid graph is the graph of $y = f(x)$ and the dashed graph is the graph of $y = g(x)$. Which of the following statements are true?



(I) $f(0) < g(0)$

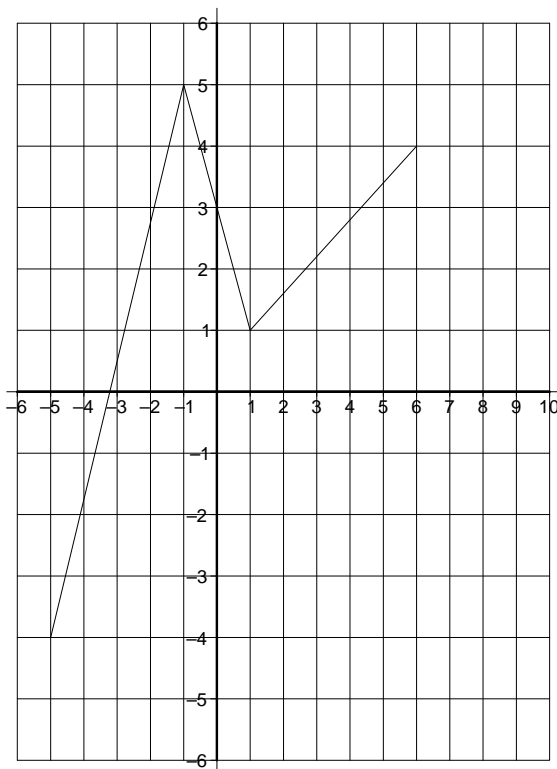
(II) $f(1) = g(1)$

(III) $f(2) > g(2)$

Possibilities:

- (a) Only **(I)** and **(III)** are true.
- (b) Only **(II)** is true.
- (c) **(I)**, **(II)**, and **(III)** are all true.
- (d) None of the statements are true.
- (e) Only **(I)** is true.

-
73. The graph of $y = f(x)$ is shown below. Find the interval(s) where $y = f(x)$ is increasing and the interval(s) where $y = f(x)$ is decreasing.



Possibilities:

- (a) Increasing: $[-5, -1] \cup [1, 6]$
Decreasing: $[-1, 1]$
- (b) Increasing: $[-4, 5] \cup [1, 4]$
Decreasing: $[5, 1]$
- (c) Increasing: $[-4, 5]$
Decreasing: $[5, 1]$
- (d) Increasing: $[-4, 5] \cup [1, 4]$
Decreasing: $[1, 5]$
- (e) Increasing: $[-5, 4]$
Decreasing: Never
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