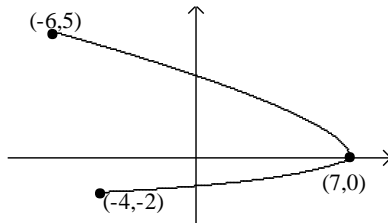


12. Determine if the following relations represent functions or not. Give the domain and range of each.

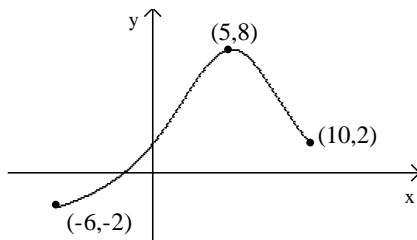
a. $\{(4, 1), (5, 2), (6, 3)\}$

b. $\{(3, 5), (4, 6), (3, 7), (2, 0)\}$

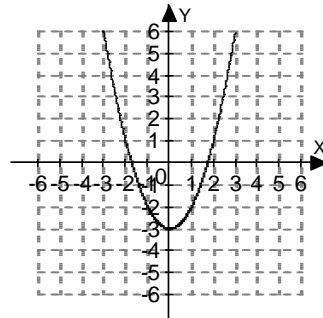
c.



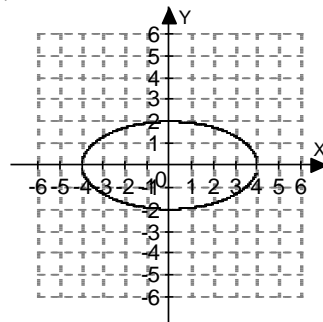
d.



e.



f.



13. For $f(x) = 2x^2 - 3$ and $g(x) = 7x - x^2$, find the following.

a. $f(-2)$

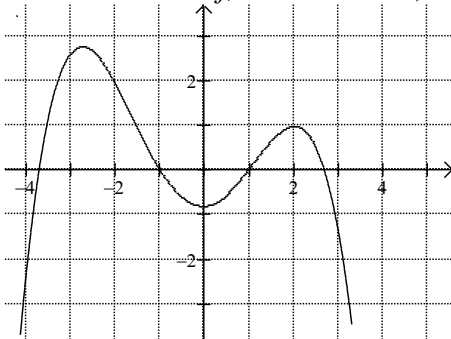
b. $(f \cdot g)(a)$

c. $(f + g)(3)$

d. $\left(\frac{f}{g}\right)(x)$

e. The domain of $\frac{f}{g}$

14. For the function f , shown below, find the following.



a. $f(1)$

b. $f(-2)$

c. For what value(s) of x is $f(x) = 1$

d. Which value is larger: $f(3)$ or $f(-3)$?

15. Give the slope and y intercept, and graph the linear function: $f(x) = -\frac{4}{5}x + 2$.

31. Solve the equation for x and simplify, if possible: $|3x - 1| = 8$
32. Graph the solution to the inequality on an xy -coordinate plane. $4x + 3y \geq 24$
33. Graph the solution to each system of inequalities on an xy -coordinate plane.
- a.
$$\begin{cases} 2x + y \leq 4 \\ y \geq 0 \end{cases}$$
- b.
$$\begin{cases} x + y > 4 \\ y \leq 2x - 4 \end{cases}$$

Factor completely, if possible:

34. $16x^2 - 49y^2$
35. $x^2 + y^2$
36. $x^3 + y^3$
37. $x^2 - 2xy + y^2$
38. $49x^2 + 112x + 64$
39. $2x^3y - 4x^2y - 6xy$
40. $81 - y^4$
41. $2x^2 + xy - 6y^2$
42. $12x^2 + 52x - 9$
43. $ab^2 + cb^2 - 4a - 4c$
44. $5r^3 - 40$

Solve the equations for x and simplify, if possible.

45. $6x^2 = 24$
46. $10x^2 + 5x = 0$
47. $(x - 2)(x + 3) = -4$
48. Find the domain of the following.
- a. $f(x) = \frac{x - 3}{x^2 - 3x}$
- b. $g(x) = x^2 + x$

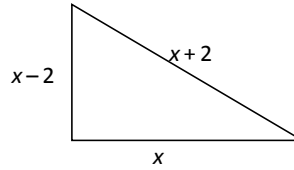
Perform the indicated operation and simplify (reduce), if possible.

49. $\frac{3x^2 + 3xy}{10x - 20} \cdot \frac{5x^2 - 20}{x^2 + 2xy + y^2}$
50. $\frac{y + 2}{3 - y} \div \frac{y^3 + 8}{3y^2 - 27}$
51. $\frac{x^2 - 2}{x - 3} + \frac{x + 4}{3 - x}$
52. $\frac{4x + 3}{x^2 + 6x + 8} + \frac{3x}{x + 2}$
53. $\frac{5y - 4}{4y - 3} - \frac{2y}{4y + 3}$
54. $1 + \frac{1}{x}$
55. $\frac{\frac{y}{x} - \frac{x}{y}}{\frac{1}{x} - \frac{1}{y}}$
56. $\frac{\frac{4x}{3} - 2}{5 + \frac{y}{x}}$

57. Find the three sides of this right triangle.

Hint: Use the Pythagorean theorem:

$$a^2 + b^2 = c^2.$$



58. The length of a rectangle is 5 cm less than twice the width. The area is 75 square cm. Find the length and the width.

Solve the equations for x and simplify, if possible.

59.
$$\frac{6}{2x+5} = \frac{4}{x-9}$$

61.
$$\frac{1}{x-5} - \frac{2}{x} = \frac{5}{x^2-5x}$$

60.
$$\frac{x+2}{x^2-5x-24} + \frac{4}{x-8} = \frac{2}{x+3}$$

62.
$$x - \frac{5}{x} = \frac{23}{x}$$

63. Carl, an experienced shipping clerk, can fill a certain order in 6 hours. Tim, a new clerk, needs 8 hours to complete the same job. How long would it take for both working together to fill the order?

64. Caleb's average driving speed is 12 kilometers per hour slower than Ling's. In the same length of time it takes Caleb to drive 231 km, Ling drives 297 km. What is Caleb's average speed?

65. Solve for R :
$$I = \frac{nE}{R+nr}$$

66. Solve for r : $rL = H(r+k)$

Simplify. Assume all variables are greater than or equal to zero.

67. $(x^6)^{1/3}$

69. $\sqrt{36b^6c^9}$

68. $\sqrt[3]{54x^8y^2z^9}$

70. $2\sqrt{27} - 5\sqrt{300}$

Multiply and simplify. Assume all variables are greater than or equal to zero

71. $(6-\sqrt{3})(2+\sqrt{3})$

72. $\sqrt{6x}(\sqrt{3x}-\sqrt{2})$

Evaluate:

73. $8^{2/3}$

74. $16^{-1/4}$

75. $(-64)^{-1/3}$

76. Solve the equation for x and simplify, if possible: $x-1 = \sqrt{3x+7}$

Perform the indicated operation and express the answer in standard form, $a+bi$:

77. $\sqrt{-25}(3-2i)$

80. $(3-6i)+(2+3i)-i^3$

78. $(2-3i)(-4-5i)$

79.
$$\frac{2+3i}{1-5i}$$

Solve each equation for x and simplify, if possible.

81. $x^2 + 2x = 4$

82. $2x^2 + 16 = 0$

83. $1 - \frac{3}{x} - \frac{7}{x^2} = 0$

84. $3x^2 - 6x + 5 = 0$

85. For each equation, use the discriminant to determine whether the quadratic equation has two unequal rational solutions, two unequal irrational solutions, one repeated real solution, or two complex solutions that are not real.

a. $x^2 + 4x + 6 = 0$

b. $x^2 - 7x + 5 = 0$

c. $6x^2 + 5x - 4 = 0$

86. Find the x -intercepts, if any, and y -intercept of the function.

a. $f(x) = x^2 - 6x + 4$

c. $h(x) = x^2 - 6x + 10$

b. $g(x) = 2x^2 - 5x + 3$

87. Graph the function $f(x) = -(x+1)^2 + 4$. From the graph, give the axis of symmetry and the vertex.

88. Graph the function $f(x) = x^2 - 6x + 4$ and determine whether it has a minimum or maximum value. Then find the minimum or maximum value.

89. In business, the total profit P is the difference between the revenue R and the cost C . For x units produced, $R(x) = 1000x - x^2$ and $C(x) = 3000 + 2x$, where $R(x)$ and $C(x)$ are dollar amounts. Find the following:

a. the total profit function $P(x)$

b. the value of x (number of units) at which the maximum total profit occurs

c. the maximum total profit.

90. The stopping distance d of a car after the brakes have been applied varies directly as the square of the speed r . A car traveling 60 mph can stop in 200 ft.

a. Express stopping distance as a function of speed.

b. What stopping distance corresponds to a speed of 36 mph?

91. The current I in an electrical conductor varies inversely as the resistance R of the conductor. If the current is 0.5 amperes when the resistance is 240 ohms, what is the current when the resistance is 960 ohms?

92. Given the points $A:(2, -3)$ and $B:(4, -2)$, find the distance from A to B and find the midpoint of the line segment joining A and B .

93. Find an equation for the circle with center $(-5, 1)$ and radius 7.

94. Find the center and radius of each circle:

a. $(x+5)^2 + (y-3)^2 = 64$

b. $x^2 + y^2 - 16x + 4y + 5 = 0$

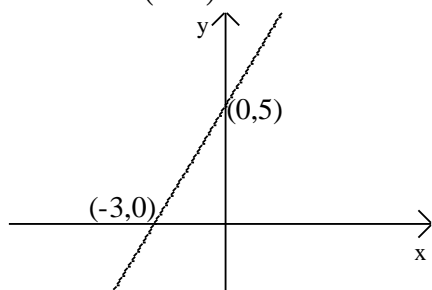
ANSWERS

1. $\frac{35x^2}{y^5}$

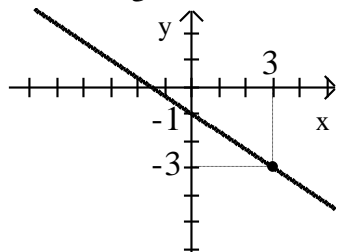
2. $\frac{16x^4}{y^2}$

3. $\frac{3c^5}{4a^6}$

4. Slope: $\frac{5}{3}$; x -intercept: $(-3,0)$; y -intercept: $(0,5)$

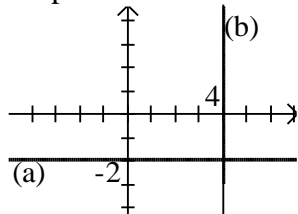


5. Slope: $-\frac{2}{3}$; y -intercept: $(0, -1)$



6. a. Slope: 0

b. Slope: undefined



7. $y = -\frac{3}{4}x - 3$

8. Slope: 0.8; y -intercept: $(0, 3.2)$
 $y = 0.8x + 3.2$

9. $y = \frac{2}{3}x + 7$

10. $y = \frac{3}{4}x - \frac{13}{2}$

11. Parallel

12.

a. Function.

Domain: $\{4, 5, 6\}$

Range: $\{1, 2, 3\}$

b. Not function.

Domain: $\{2, 3, 4\}$

Range: $\{0, 5, 6, 7\}$

c. Not function.

D: $\{x | -6 \leq x \leq 7\}$ or $[-6, 7]$

R: $\{y | -2 \leq y \leq 5\}$ or $[-2, 5]$

d. Function.

D: $\{x | -6 \leq x \leq 10\}$ or $[-6, 10]$

R: $\{y | -2 \leq y \leq 8\}$ or $[-2, 8]$

e. Function.

D: \square or $(-\infty, \infty)$

R: $\{y | y \geq -3\}$ or $[-3, \infty)$

f. Not function.

D: $\{x | -4 \leq x \leq 4\}$ or $[-4, 4]$

R: $\{y | -2 \leq y \leq 2\}$ or $[-2, 2]$

13.

a. 5

b. $-2a^4 + 14a^3 + 3a^2 - 21a$

c. 27

d. $\frac{2x^2 - 3}{7x - x^2}$

e. $\{x | x \neq 0, 7\}$

14.

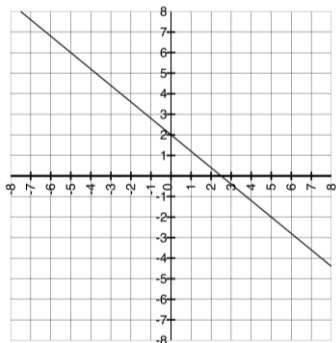
a. 0

b. 2

c. $\{-3.5, -1.5, 2\}$

d. $f(-3)$

15. Slope: $-\frac{4}{5}$; y-intercept: $(0,2)$



16.

a. $D(x) = -2.4x + 22.6$

b. 1 million pounds

c. \$9.42

17.

a. $y = 3x + 33$

b. 54 loans

18.

a. $w = 2400 + 0.035x$

b. \$28,000

19.

a. $(5, -1)$

b. $(2, -3)$

c. No solution

20. 39, 56

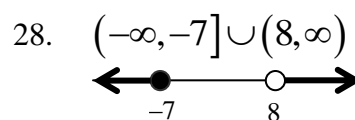
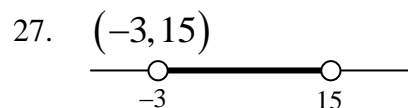
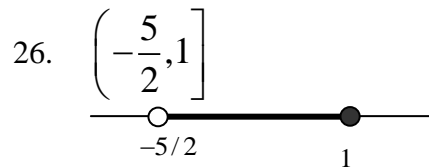
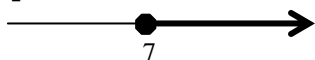
21. The canoe moves 8 mph.
The motor boat moves 20 mph.

22. Still air speed is 550 mph.
Wind speed is 50 mph

23. 3.2 ounces

24. \$72,500 in stocks
\$47,500 in bonds.

25. $[7, \infty)$

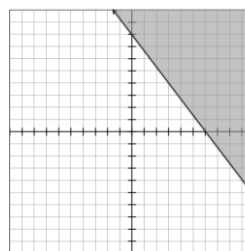


29. $x - 3 - \frac{18}{x - 4}$

30. $4x^2 - 2x + 5 + \frac{6}{2x + 1}$

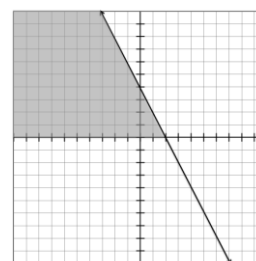
31. $\left\{3, -\frac{7}{3}\right\}$

32.

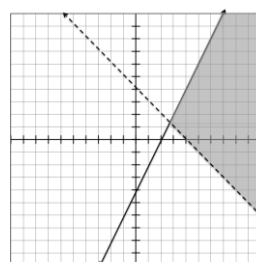


33.

a.



b.



34. $(4x + 7y)(4x - 7y)$
35. Prime (Sum of squares)
36. $(x + y)(x^2 - xy + y^2)$
37. $(x - y)^2$
38. $(7x + 8)^2$
39. $2xy(x + 1)(x - 3)$
40. $(3 - y)(3 + y)(9 + y^2)$
41. $(2x - 3y)(x + 2y)$
42. $(6x - 1)(2x + 9)$
43. $(a + c)(b - 2)(b + 2)$
44. $5(r - 2)(r^2 + 2r + 4)$
45. ± 2
46. $\left\{0, -\frac{1}{2}\right\}$
47. $\{-2, 1\}$
48. a. $\{x | x \neq 0, 3\}$
b. all real numbers
49. $\frac{3x(x + 2)}{2(x + y)}$
50. $\frac{-3(y + 3)}{y^2 - 2y + 4}$
51. $x + 2$
52. $\frac{3x^2 + 16x + 3}{(x + 2)(x + 4)}$
53. $\frac{12y^2 + 5y - 12}{(4y + 3)(4y - 3)}$
54. $\frac{x + 1}{x}$
55. $y + x$
56. $\frac{2x(2x - 3)}{3(5x + y)}$
57. 6, 8, 10
58. $L = 10$ cm, $W = 7.5$ cm
59. -37
60. -10
61. No Solution (5 is not in domain)
62. $\pm 2\sqrt{7}$
63. $3\frac{3}{7}$ hours
64. 42 km/h
65. $R = \frac{nE - nrI}{I}$
66. $r = \frac{Hk}{L - H}$
67. x^2
68. $3x^2z^3\sqrt[3]{2x^2y^2}$
69. $6b^3c^4\sqrt{c}$
70. $-44\sqrt{3}$
71. $9 + 4\sqrt{3}$
72. $3x\sqrt{2} - 2\sqrt{3x}$
73. 4
74. $\frac{1}{2}$

75. $-\frac{1}{4}$

76. 6 (-1 is extraneous)

77. $10 + 15i$

78. $-23 + 2i$

79. $-\frac{1}{2} + \frac{1}{2}i$

80. $5 - 2i$

81. $-1 \pm \sqrt{5}$

82. $\pm 2i\sqrt{2}$

83. $\frac{3 \pm \sqrt{37}}{2}$

84. $\frac{3 \pm i\sqrt{6}}{3}$

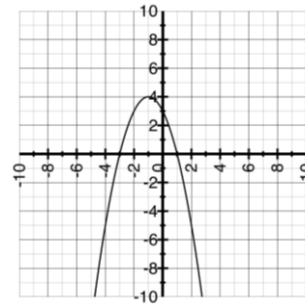
85.

- a. Two imaginary solutions
- b. Two real (irrational) solutions
- c. Two real (rational) solutions

86.

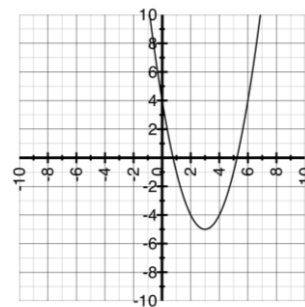
- a. x -intercepts: $(3 + \sqrt{5}, 0)$,
 $(3 - \sqrt{5}, 0)$
 y -intercept: $(0, 4)$
- b. x -intercepts: $(\frac{3}{2}, 0)$, $(1, 0)$
 y -intercept: $(0, 3)$
- c. No x -intercepts;
 y -intercept: $(0, 10)$

87.



Axis of symmetry: $x = -1$
Vertex: $(-1, 4)$

88.



The function f has a minimum value of -5.

89. $P(x) = -x^2 + 998x - 3000$

- a. 499 units
- b. \$246,001

90.

- a. $d = \frac{1}{18}r^2$
- b. 72 ft

91. 0.125 amperes

92. $d = \sqrt{5}$; midpoint is $(3, -\frac{5}{2})$

93. $(x + 5)^2 + (y - 1)^2 = 49$

94.

- a. Center: $(-5, 3)$; Radius: 8
- b. Center: $(8, -2)$; Radius: $3\sqrt{7}$