pp. 8-10 (#3-8; #10-26 evens; #49-50)

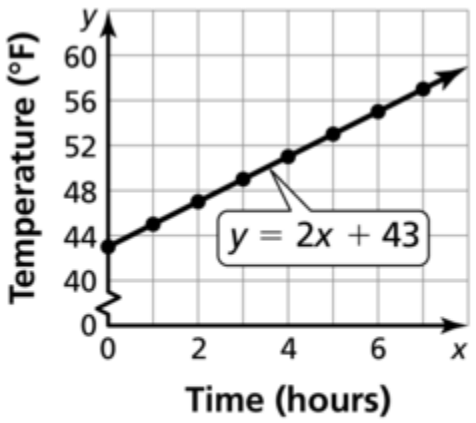
3. The function f belongs to the family of absolute value functions. The graph of $f(x) = 2|x + 2| - 8$ is a horizontal translation 2 units left followed by a vertical stretch and a vertical translation 8 units down of the parent absolute value function. The domain of each function is all real numbers, but the range of f is $y \geq -8$, and the range of the parent function is $y \geq 0$.

4. quadratic; The graph is a reflection in the x-axis with a vertical stretch and a translation 3 units up; The domain of each function is all real numbers, but the range of f is $y \leq 3$, and the range of the parent quadratic function is $y \geq 0$.

5. linear; The graph is a vertical stretch and a translation 2 units down; The domain and range of each function is all real numbers.

6. constant; The graph is a translation 2 units up; The domain of each function is all real numbers, but the range of f is $y = 3$, and the range of the parent function is $y = 1$.

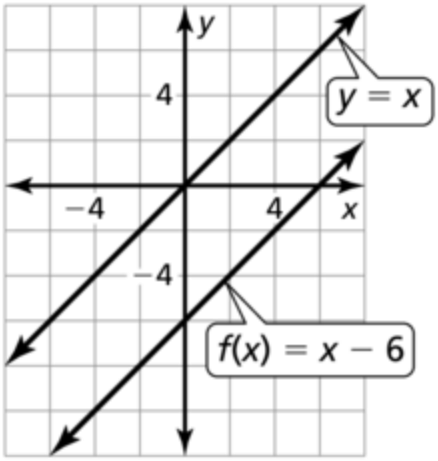
7.



linear; The temperature is increasing by the same amount at each interval.

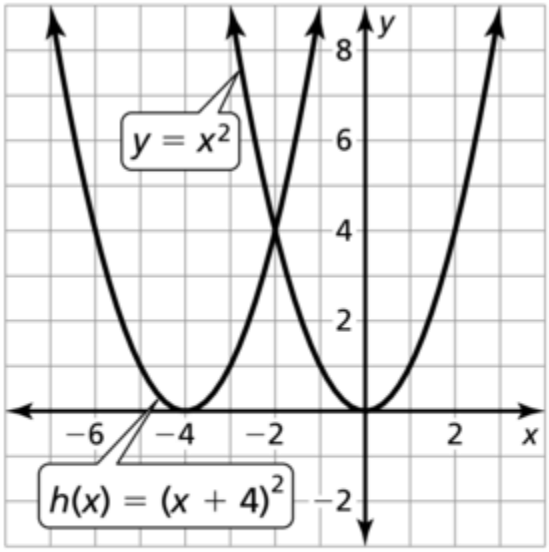
8. quadratic

10.



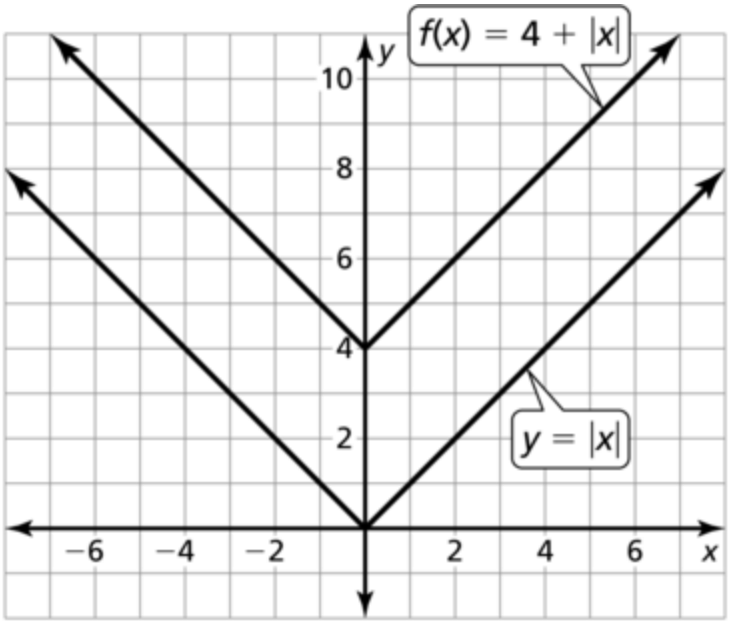
The graph of f is a vertical translation 6 units down of the parent linear function.

12.



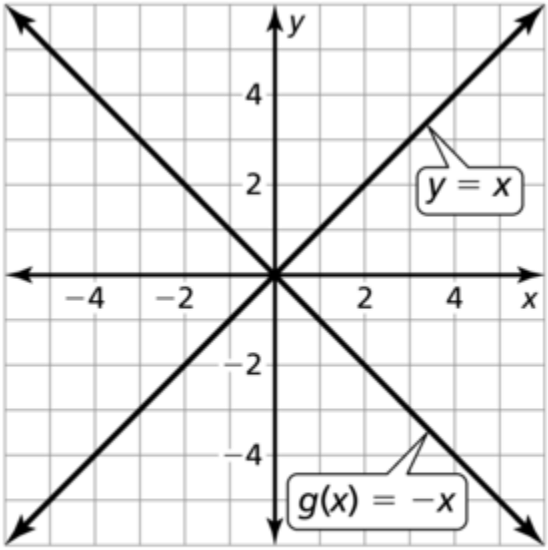
The graph of h is a horizontal translation 4 units left of the parent quadratic function.

14.



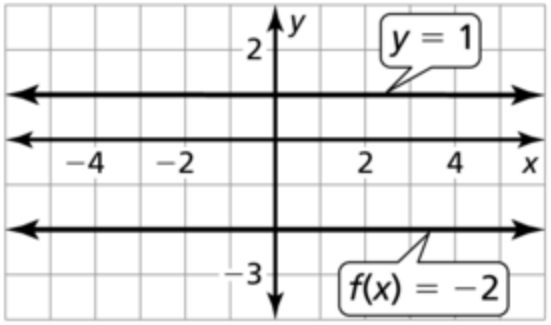
The graph of f is a vertical translation 4 units up of the parent absolute value function.

16.



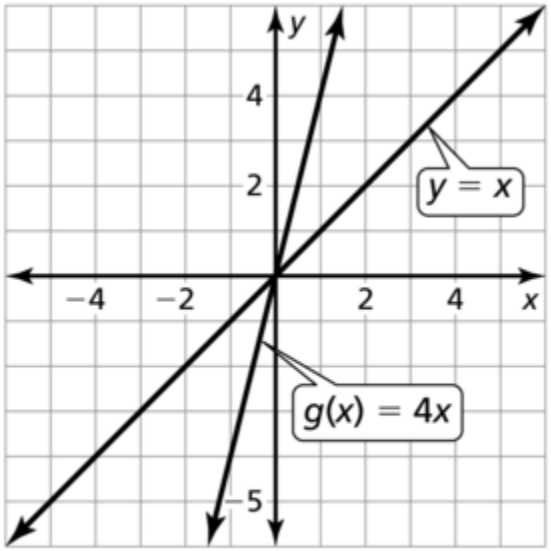
The graph of g is a reflection in the x-axis of the parent linear function.

18.



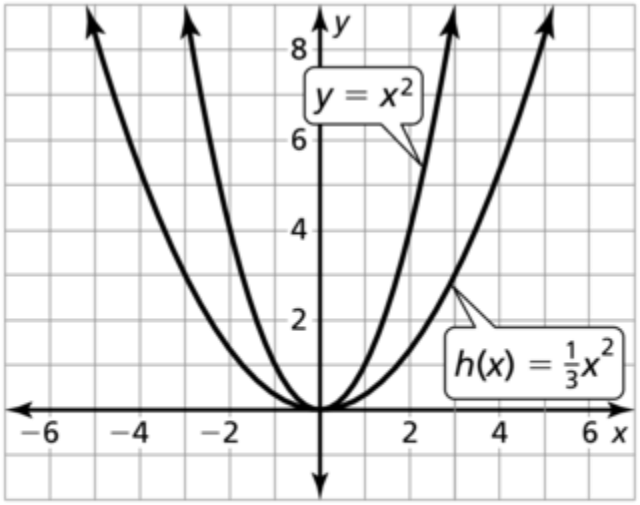
The graph of f is a vertical translation 3 units down of the parent constant function.

20.



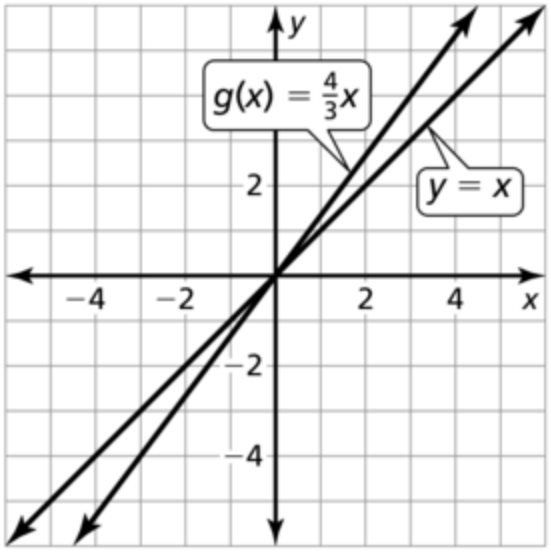
The graph of g is a vertical stretch of the parent linear function.

22.



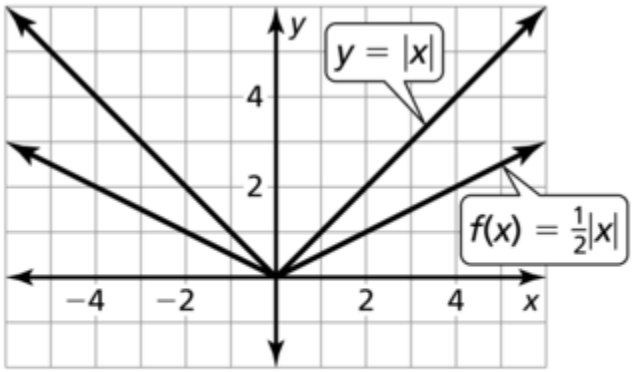
The graph of h is a vertical shrink of the parent quadratic function.

24.



The graph of g is a vertical stretch of the parent linear function.

26.



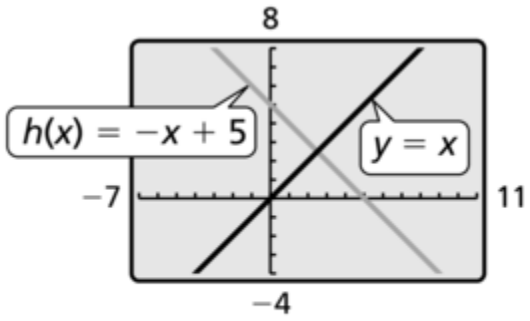
The graph of f is a vertical shrink of the parent absolute value function.

49. yes; Shifting the parent linear function down 2 units will create the same graph as shifting it 2 units right.

50. linear; vertical translation; The graph will be shifted up 10 units to represent the head start.

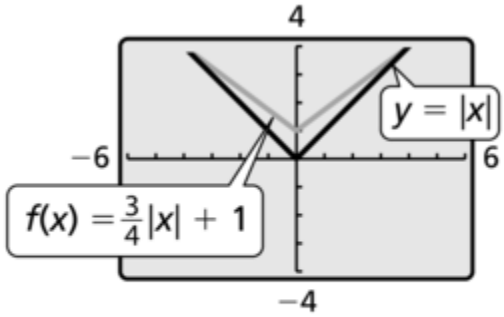
pp. 9-10 (#28-34 evens; #35-38; #40-44 evens; 45, 47-48, 51-54)

28.



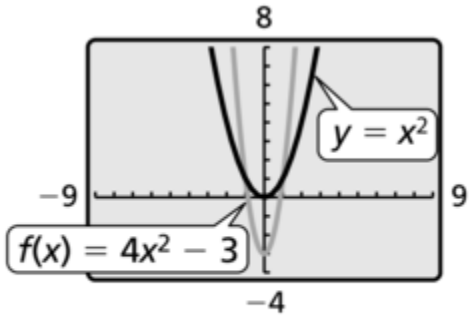
The graph of h is a reflection in the x axis followed by a translation 5 units up of the parent linear function.

30.



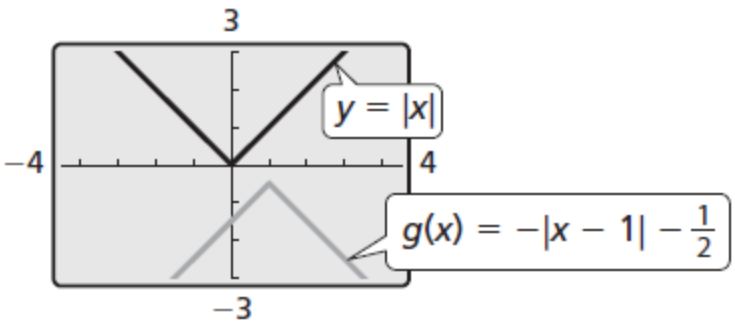
The graph of f is a vertical shrink followed by a translation 1 unit up of the parent absolute value function.

32.



The graph of f is a vertical stretch followed by a translation 3 units down of the parent quadratic function.

34.



The graph of g is a reflection in the x-axis followed by a translation 1 unit right and $\frac{1}{2}$ unit down of the parent absolute value function.

35. It is a vertical stretch, not shrink. The graph is a reflection in the x-axis followed by a vertical stretch of the parent quadratic function.

36. The function should be $f(x) = |x - 3|$ rather than $f(x) = |x + 3|$. The graph is a translation 3 units right of the parent absolute value function so the function is $f(x) = |x - 3|$.

37. $(2, -1), (-1, -4), (2, -5)$

38. $(-1, -3), (1, -3), (-1, -1), (-3, -1)$

40. absolute value; domain is all real numbers; range is $y \geq 2$

42. linear; domain is all real numbers; range is all real numbers

44. quadratic; domain is all real numbers; range is $y \leq 6$

45. absolute value; 8 mi/h

47. no; f is shifted right and g is shifted down.

48. **a.** vertical shrink; The factor is $\frac{1}{2}$.

b. Multiply the y-coordinate of each point on f by -2.

51. **a.** quadratic

b. 0; At the moment the ball is released, 0 seconds have passed.

c. 5.2; Because $f(t)$ represents the height of the ball, find $f(0)$.

52. absolute value; The x-intercept represents the number of hours that have passed at the moment the computer has 0 battery life remaining.

53. **a.** vertical translation; The graph will have a vertical stretch and will be shifted 3 units down.

b. horizontal translation; The graph will be shifted 8 units right.

c. both; The graph will be shifted 2 units left and 4 units up.

d. neither; The graph will have a vertical stretch.

54. **a.** 1; The graph will intersect the x-axis at $x = -\frac{1}{3}$.

b. 2; The graph will intersect the x-axis at $x = 2$ and $x = 4$.

c. -1; The graph will intersect the x-axis at $x = 1$ and $x = -1$.

d. 0; The graph will intersect the x-axis everywhere.

pp. 16-17 (#3-26)

3. $g(x) = x - 1$

4. $g(x) = x$

5. $g(x) = |4x + 3|$

6. $g(x) = 2x - 3$

7. $g(x) = 4 - |x - 2|$

8. $g(x) = |4x| + 6$

9. f could be translated 3 units up or 3 units right.

10. translate f up 12,000 units; 3 weeks

11. $g(x) = 5x - 2$

12. $g(x) = -\frac{1}{2}x + 3$

13. $g(x) = |6x| - 2$

14. $g(x) = |-2x - 1| + 3$

15. $g(x) = -3 + |x + 11|$

16. $g(x) = x + 1$

17. $g(x) = 5x + 10$

18. $g(x) = x + 3$

19. $g(x) = |4x| + 4$

20. $g(x) = \left|\frac{1}{4}x + 3\right|$

21. $g(x) = -|x - 4| + 1$

22. $g(x) = 6 - 3x$

23. C; The graph has been translated left.

24. A; The graph has been stretched vertically.

25. D; The graph has been translated up.

26. B; The graph has been shrunk horizontally.

pp. 17-18 (#27-45 all)

27. $g(x) = 2x + 1$

28. $g(x) = \frac{1}{3}x - 1$

29. $g(x) = \left|\frac{1}{2}x - 2\right|$

30. $g(x) = |x - 3|$

31. $g(x) = -|x| - 8$

32. $g(x) = |x - 1| - 3$

33. Translating a graph to the right requires subtraction, not addition; $g(x) = |x - 3| + 2$

34. A vertical stretch is given by $y = a \cdot f(x)$, not $y = f(ax)$; $g(x) = 5(x - 6)$ or $g(x) = 5x - 30$

35. no; Suppose a graph contains the point (3, 2) and is translated up 3 units then reflected in the x-axis. The new coordinate is (3, −5). If it is reflected in the x-axis first then translated up 3, the new coordinate is (3, 1).

36. *Sample answer:* horizontally shrink by a factor of $\frac{1}{2}$; The sales in 2010 are \$6 billion instead of \$11.6 billion.

37. The graph has been translated 6 units left; $A = 9$

38. The graph has been translated 5 units up; $A = 9$

39. The graph has been reflected in the x-axis; $A = 16$

40. The graph has been reflected in the y-axis; $A = 25$

41. **a.** $f(x) + (c - b)$

b. $f\left(x + \frac{c - b}{m}\right)$

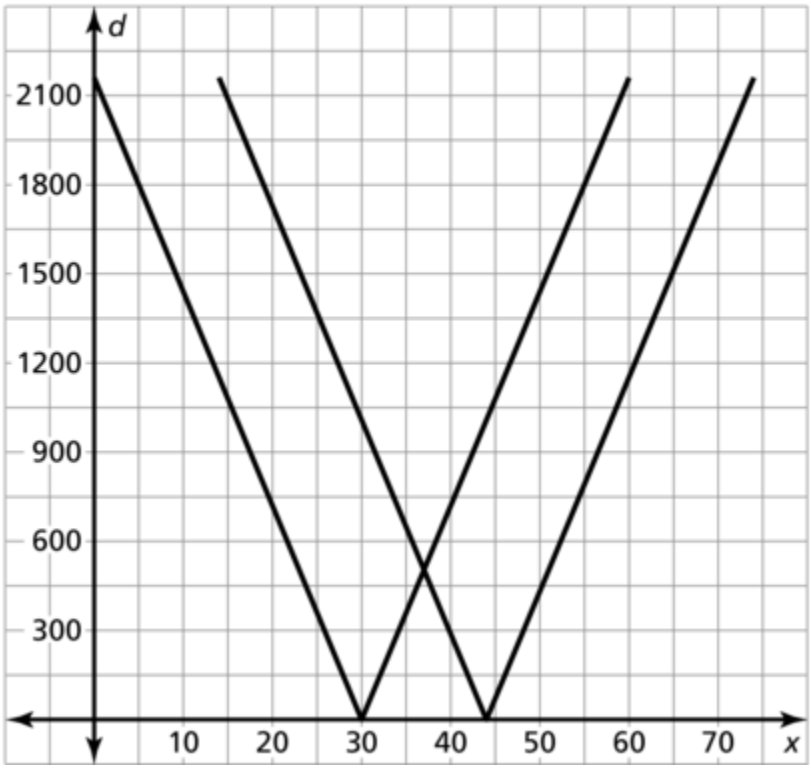
42. **a.** The sign of the slope and x-intercept are switched, but the y-intercept does not change.

b. Both the slope and y-intercept are reduced by a factor of $\frac{1}{3}$, and the x-intercept does not change.

c. The slope is reduced to half of its original value and the x-intercept is doubled, but the y-intercept does not change.

43. vertical stretch, translation, reflection; *Sample answer:* $-(4|x| - 2) = -4|x| + 2$

44. *Sample answer:* $d = 72|x - 44|$; You leave on June 15 rather than on June 1.



45. $a = -2$, $b = 1$, and $c = 0$; $g(x) = -2|x - 1|$ represents the transformation of $f(x)$.

pp. 26-28 (#4-12 evens; #13-18, #20-26 evens, #27-32)

4. $y = -\frac{1}{30}x + 12$; The fuel decreases $\frac{1}{30}$ gallon for every mile driven.

6. $y = \frac{3}{2}x$; The height increases 1.5 feet each year.

8. $y = -60x + 480$; The volume decreases 60 cubic feet per hour.

10. **a.** $y - 212 = \frac{9}{5}(x - 100)$ or $y = \frac{9}{5}x + 32$

b. 71.6°F

c. $y = \frac{5}{9}(x - 32)$

d. about 28.33°C

12. The slope was miscalculated; The slope is 11, so the income is \$11 per hour.

13. yes; *Sample answer:* $y = 4.25x + 1.75$; $y = 65.5$; After 15 minutes, you have burned 65.5 calories.

14. yes; *Sample answer:* $y = 0.55x - 2.25$; $y = 6$; After 15 months, the hair will be 6 inches in length.

15. yes; *Sample answer:* $y = -4.6x + 96$; $y = 27$; After 15 hours, the battery will have 27% of life remaining.

16. no

17. $y = 380.03x + 11{,}290$; \$16,990.45; The annual tuition increases about \$380 each year and the cost of tuition in 2005 is about \$11,290.

18. *Sample answer:* $y = -6.2x + 549$; no; The value 85 is not close to the values used to create the line of fit.

20. $y = 0.88x + 1.69$; $r = 0.88$; strong positive correlation

22. $y = -1.04x + 5.68$; $r = -0.93$; strong negative correlation

24. $y = -0.48x + 4.08$; $r = -0.91$; strong negative correlation

26. **a.** $-\frac{5}{4}$; the decrease in balance per month

b. domain: $0 \leq x \leq 24$, range: $0 \leq y \leq 3000$; The domain represents the term of the balance of the loan from start to finish, and the range represents the balance of the loan.

c. \$1500

27. no; Because r is close to 0, the points do not lie close to the line.

28. *Sample answer:* A: $(0, 4)$, B: $(4, 0)$, C: $(0, 0)$; line connecting A and C: $x = 0$; line connecting B and C: $y = 0$

29. It is negative; As x increases, y increases, so z decreases.

30. D

31. about 2.2 mi

32. **a.** A positive correlation does make sense because the number of computers per capita and the average life expectancy have both increased over time, which would relate to a positive slope.

b. It is not reasonable to conclude that giving residents of a country computers will lengthen their lives. There is a correlation, but there is not a causation between the two quantities.

pp. 34-35 (#2-28 evens)

4. $(-3, -1, -1)$

6. $(1, 1, -3)$

8. $\left(-\frac{22}{13}, \frac{29}{13}, \frac{6}{13}\right)$

10. The entire first equation should be multiplied by 3, not just one side.

$$\begin{aligned} 12x - 3y + 6z &= -54 \\ 3x + 3y - 4z &= 44 \\ \hline 15x + 2z &= -10 \end{aligned}$$

12. no solution

14. $(x, x + 2, 3x + 1)$

16. $(-2y + 1, y, -y - 4)$

18. Use the equations $S + L = 1300$, $S + 2C = 1400$, and $S + L + C = 1600$ to describe each price, and then solve the system; A sofa costs \$800, a love seat costs \$500, and a chair costs \$300.

20. $(4, 3, -3)$

22. $\left(-\frac{11}{13}, -\frac{1}{13}, -\frac{30}{13}\right)$

24. $(4, -10, -10)$

26. $(5, 0, -5)$

28. no solution

pp. 35-36 (#29-43)

29. 1%

30. 7 first-place finishers, 10 second-place finishers, 3 third-place finishers

31. *Sample answer:* When one variable has the same coefficient or its opposite in each equation. The system

$3x + 2y - 4z = -5$

$2x + 2y + 3z = 8$

$5x - 2y - 7z = -9$

can be solved by eliminating y first.

32. *Sample answer:* Eliminate one variable in three of the equations and solve for the remaining variables. Then substitute the values into one of the original equations to find the value of the fourth variable.

33. $\ell + m + n = 65$, $n = \ell + m - 15$, $l = \frac{1}{3}m$; $\ell = 10$ ft, $m = 30$ ft, $n = 25$ ft

34. $A + B + C = 180$, $B = 5A - C$, $C = A + B$; $m\angle A = 30°$, $m\angle B = 60°$, $m\angle C = 90°$

35. **a.** *Sample answer:* $a = -1, b = -1, c = -1$; Use elimination on equations 1 and 2.

b. *Sample answer:* $a = 4, b = 4, c = 5$; The solution is $\left(\frac{2}{3}, -\frac{2}{3}, 2\right)$.

c. *Sample answer*: $a = 5, b = 5, c = 5$; Use elimination on equations 1 and 2.

36. no; It is possible for a point (x, y, z) to satisfy two equations but not the third.

37. 350 ft^2

38. yes; Any solution of the form $\left(-\frac{1}{4}y, y, 0\right)$ will satisfy the system.

39. **a.** $r + l + i = 12$, $2.50r + 4l + 2i = 32$, $r = 2l + 2i$

b. 8 roses, 2 lilies, 2 irises

c. no; *Sample answer*: 8 roses, 4 lilies, 0 irises; 8 roses, 0 lilies, 4 irises; 8 roses, 3 lilies, 1 iris

40. **a.** one solution; The circles intersect at exactly one point.

b. no solution; There are no points in common with all three circles.

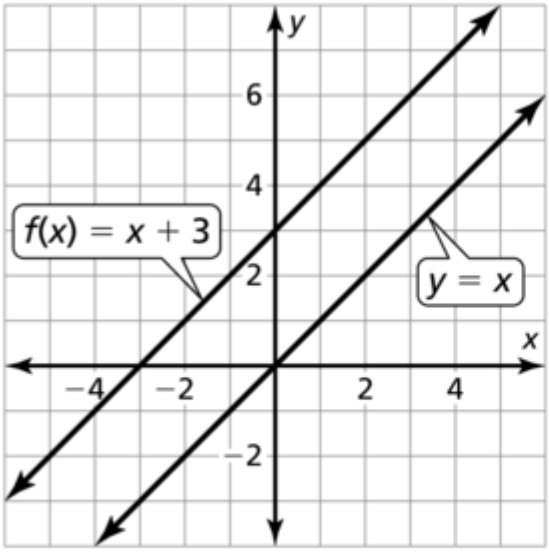
41. $a = 12$, $b = -4$, $c = 10$; These are the values you obtain when you substitute -1 for x, 2 for y, and -3 for z.

42. $3x + 2y + (-5)z = -30$ or $2x + (-5)y + 3z = -30$; The solutions are $(-3, 2, 5)$ and $(-699, -288, -24)$, respectively.

43. $t + a = g$, $t + b = a$, $2g = 3b$; 5 tangerines

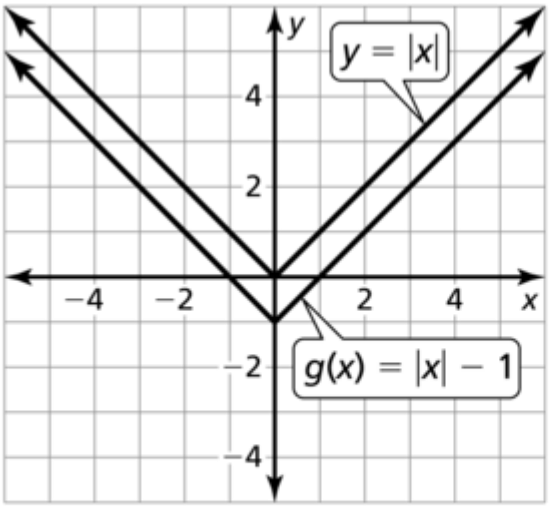
pp. 38-40 (#1-18)

1.



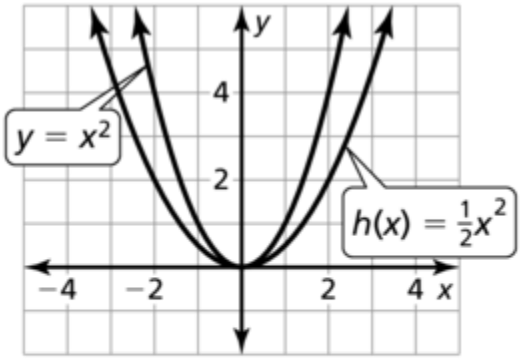
The graph of f is a translation 3 units up of the parent linear function.

2.



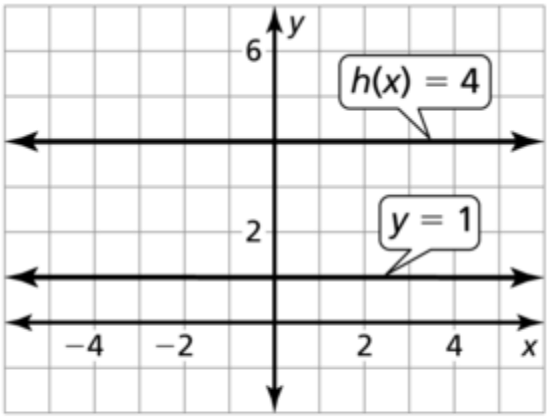
The graph of g is a translation 1 unit down of the parent absolute value function.

3.



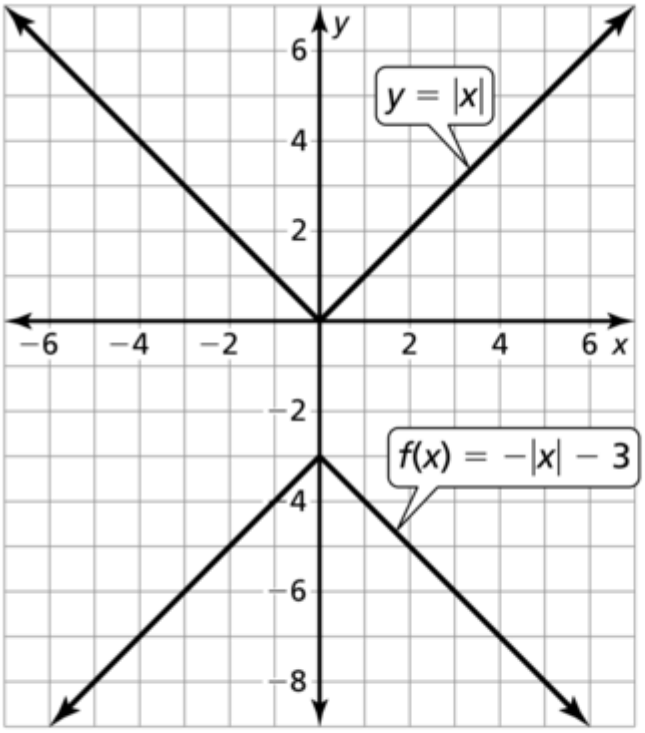
The graph of h is a vertical shrink by a factor of $\frac{1}{2}$ of the parent quadratic function.

4.



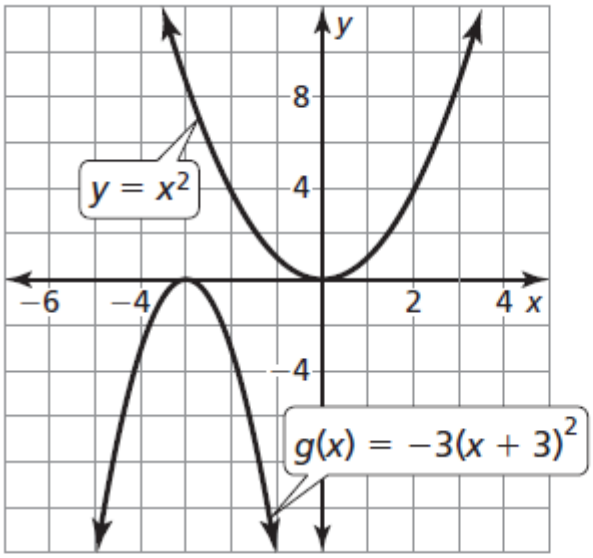
The graph of h is a translation 3 units up of the parent constant function.

5.



The graph of f is a reflection in the x-axis followed by a translation 3 units down of the parent absolute value function.

6.



The graph of g is a vertical stretch by a factor of 3 followed by a reflection in the x-axis and a translation 3 units left of the parent quadratic function.

7. $g(x) = -|x + 4|$

8. $g(x) = \frac{1}{2}|x| + 2$

9. $g(x) = -x - 3$

10. $y = 0.03x + 1.23$

11. $y = 0.35x$; 15.75 mi

12. $(4, -2, 1)$

13. $\left(-\frac{4}{3}, -\frac{17}{3}, \frac{26}{3}\right)$

14. $(9 + 4y, y_1 - 7 - 5y)$

15. no solution

16. $(-11, -8, 3)$

17. $(-16, 12, 10)$

18. 200 student tickets, 350 adult tickets, and 50 children under 12 tickets