Chapter 8: Functions

Section 8.1

1. a. 

![Diagram](Diagram)

b. A function requires that each input be associated with one and only one output. This is not a function; the input is associated with two outputs, win and lose.

3. a. Function; domain: {Lab, Husky, Poodle}; range: {dog}
   b. Not a function; the input H2O has associated with it, more than one output.

5. a. 0 seconds and 2.5 seconds
   b. Domain: \( \{ x \mid 0 \leq x \leq 2.5 \} \)
   c. 0 feet and 100 feet
   d. Range: \( \{ x \mid 0 \leq y \leq 100 \} \)
   e. In a real-life problem, the limits of the domain are used to set Xmin and Xmax and the limits of the range are used to set Ymin and Ymax.
   f. Quadrant I; the domain and range are both nonnegative.

7. \( f(0) = 0 \)
   \( f(2) = 12 \)
   \( f(3) = 27 \)

9. a. \( f(x) = x - 5 \)
   \( f(2) = 2 - 5 \)
   = -3
   b. \( g(x) = x^2 - 3x \)
   \( g(-4) = (-4)^2 - 3(-4) \)
   = 28
   c. \( h(t) = -4.9t^2 + 10t + 5 \)
   \( h(3) = -4.9(3)^2 + 10(3) + 5 \)
   = -9.1

11. In the Y= menu, enter \( Y1 = 4X^2 + 5X + 2 \). On the home screen type \( Y1(2.15) \) and press ENTER, see p 305 of the text.

\( f(2.15) = 16.641 \)

13. a. The parabola continues to spread left to \( -\infty \) and right to \( \infty \); domain: \( \{ x \mid -\infty < x < \infty \} \).
The parabola has a maximum y-value of 2 and continues downward to \( -\infty \); range: \( \{ y \mid y \leq 2 \} \).
   b. The graph continues to spread left and right; domain \( \{ x \mid -\infty < x < \infty \} \).
The graph has a minimum y-value of 2 and continues upward to \( \infty \); range: \( \{ y \mid y \geq 2 \} \).
   c. The line continues left and right; domain: \( \{ x \mid -\infty < x < \infty \} \).
The only y-value is 5; range: \( \{ y \mid y = 5 \} \).

15. a. Range: \( \{ y \mid y \geq 0 \} \).
The outputs will be nonnegative so the graph will only appear in Quadrants I and II.
   b. The absolute value of any real number results in an output greater than or equal to zero.

Skills and Review 8.1

17. The x-coordinate of the vertex gives the width that maximizes area. We found this in Exercise 16;
   \( w = 45 \). The width is 45 feet and the length is
   \( 180 - 2w = 90 \) feet.

19. a. \( 0 = x^2 + 8x + 16 \)
   Windows may vary: Xmin = -9.4, Xmax = 9.4, Ymin = -3.1, Ymax = 3.1

b. \( 0 = x^2 + 8x + 16 \)
   \( 0 = x^2 + 4x + 4x + 16 \)
   \( 0 = (x + 4)(x + 4) \)
   \( x + 4 = 0 \)
   \( x = -4 \)

c. \( a = 1, b = 8, c = 16 \)
   \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \)
   \( = \frac{-8 \pm \sqrt{64 - 4*1*16}}{2*1} \)
   \( = \frac{-8 \pm \sqrt{0}}{2} \)
   \( = -4 \pm \frac{0}{2} \)
   \( x = -4 \)
21. \( \frac{1}{5} x^2 = 7 \)
   \[ x^2 = 35 \]
   \[ x = \pm \sqrt{35} \]
   \[ x = 5.92 \]

23. a. \( \frac{1}{x^2} = x^2 \)

   b. \( x^{-2} = \frac{1}{x^2} \)

25. \( y = kx \)
   \[ -6 = k(-4) \]
   \[ \frac{3}{2} = k \)