Concept and Vocabulary Check:

1. Any set of ordered pairs is called a/an _____. The set of all first components of the ordered pairs is called _____. The set of all second components of the ordered paris is called the _____.

2. A set of ordered paris in which each first component corresponds to exactly one second component is called a/an _____.

3. The notation $f(x)$ describes the value of _____ at _____.

4. A function of the form $f(x) = mx + b$ is called a/an _____ function.

5. A function of the form $f(x) = ax^2 + bx + c$, $a \neq 0$, is called a/an _____ function.

Practice Exercises:

In exercises 1 - 7 odd, determine whether each relation is a function. Give the domain and range for each relation.

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

3. $\{(3, 4), (3, 5), (4, 4), (4, 5)\}$

5. $\{(-3, -3), (-2, -2), (-1, -1), (0, 0)\}$

7. $\{(1, 4), (1, 5), (1, 6)\}$

In exercises 9 -21 odd, evaluate each function at the given values.

9. $f(x) = x + 5$

    a. $f(7)$ b. $f(-6)$ c. $f(0)$

11. $f(x) = 7x$

    a. $f(10)$ b. $f(-4)$ c. $f(0)$

13. $f(x) = 8x - 3$

    a. $f(12)$ b. $f(-\dfrac{1}{2})$ c. $f(0)$

15. $g(x) = x^2 + 3x$

    a. $g(2)$ b. $g(-2)$ c. $g(0)$

17. $h(x) = x^2 - 2x + 3$

    a. $h(4)$ b. $h(-4)$ c. $h(0)$

19. $f(x) = 5$

    a. $f(9)$ b. $f(-9)$ c. $f(0)$

21. $f(r) = \sqrt{r + 6} + 3$

    a. $f(-6)$ b. $f(10)$

In exercises 25 - 32 ALL, copy the graph from the book in the space provided then identify graphs which represent y as a function of x.

25.

29.

26.

30.

27.

31.

28.

32.

In exercises 37 and 39, find

$$\frac{f(x)-f(h)}{x-h}$$

and simplify.

37. $f(x) = 6x + 7$ 39. $f(x) = x^2 - 1$

Applications:

43. The function $f(x) = 0.76x + 171.4$ models the cholesterol level of an American man as a function of his age, x, in years. Find and interpret $f(20)$.

45. The bar graphs and the quadratic functions that model the data shown in the text on pages 673 and 674 indicate that the cheaper cellphone calls got, the more Americans wanted to talk.

The function $C(x) = 0.28x^2 - 5.2x + 29$ models the average cost of cellphone use per minute, $C(x)$, in cents, x years after 2000.

a. Find $C(9)$. Round to the nearest whole number and interpret the result.

c. Find and interpret $C(0)$. How is this shown on the graph of C on page 673?

b. Does the rounded value you obtained in part (a) underestimate or overestimate the value displayed by the bar graph at the bottom of page 673? By how much?

Critical Thinking Exercises:

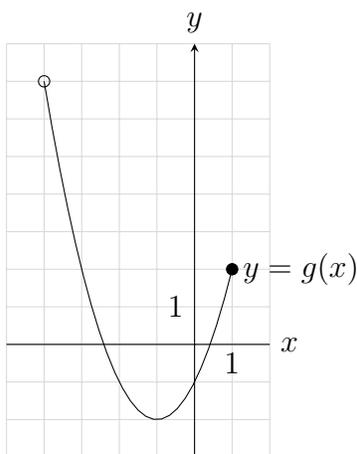In exercises 52 and 53, determine whether or not the relation can be called a function.

52. For a specific time of day, give a person's body temperature.

53. Give a person's height for a specific age.

Supplemental Exercises:

1. Functions f, g, and h are defined below. Use them to answer the given questions.

$f(x) = 3x - 7$

x	$y = h(x)$
-7	-3
0	64
1	64
3	-4
5	0
10	3

a. Evaluate $f(-3)$

b. Evaluate $g(0)$

c. Solve $f(x) = 11$

d. Evaluate $g(-3)$

e. Evaluate $h(3)$

f. If $g(x) = 2$, then what does x have to equal?

g. Evaluate $h(-7)$

h. Evaluate $h(-3)$

i. If $h(x) = 0$, then what does x have to equal?

j. State the domain of g.

k. State the range of g.

l. State the domain of h.

m. State the range of h.

2. A company's profit can be modeled by the function $P(t) = t^2 - 6t + 17$ where the profit (in thousands of dollars) for the year that is t years since 2005.

    a. Find and interpret $P(3)$.

   b. Determine when the profit gained by the company was $24,000. Show your work. Give your answer in a sentence.

3. A baseball batter hits a ball into the air. The height (in feet) of the baseball after t seconds is given by the function f in the following graph. Use the graph to answer the following questions.

    a. Estimate $f(3)$ and interpret.

h feet

    b. If $f(t) = 20$, the $t \approx$ _____.
       Interpret.

    c. When will the ball be at a height of 50 feet?
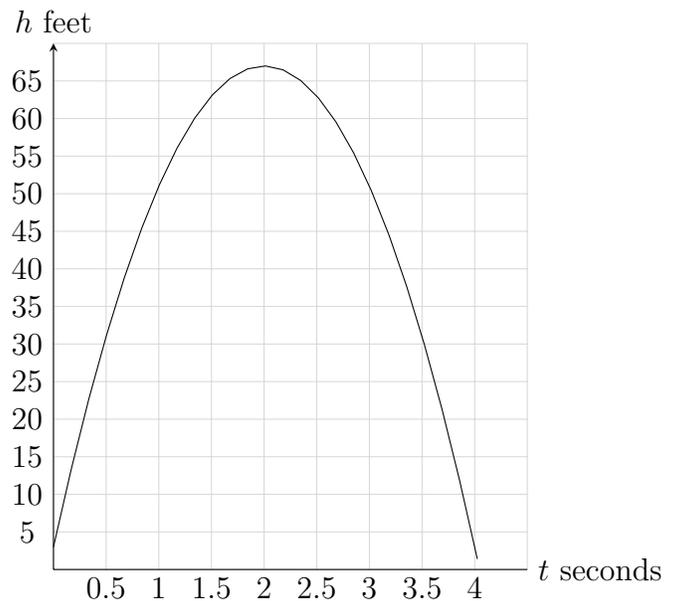
    d. What are the domain and range of this function? Interpret each based on this application.

Supplemental Solutions:

1. a. $f(-3) = -16$

    b. $g(0) = -1$

    c. $x = 6$. That is, the set of solutions is $\{6\}$.

    d. $g(-3) = 2$

    e. $h(3) = -4$

    f. If $g(x) = 2$ then $x = 1$ or $x = -3$.

    g. $h(-7) = -3$

    h. $h(-3)$ is undefined.

    i. If $h(x) = 0$, then $x = 5$.

    j. The domain of g is $(-4, 1] = \{x | -4 < x \leq 1\}$.

    k. The range of g is $[-2, 7) = \{y | -2 \leq y < 7\}$.

    l. The domain of h is $\{-7, 0, 1, 3, 5, 10\}$.

    m. The range of h is $\{-4, -3, 0, 3, 64\}$.

2. a. $P(3) = 8$ meaning that three years after 2005 (2008) the profit of this business was $8,000.

    b. We solve the equation $24 = P(t)$ to obtain $t = 7$ meaning that the company will have a $24,000 profit 7 years after 2005 (2012).

3. a. $f(3) \approx 51$ meaning that 3 second after the ball is hit it is 51 feet high.

    b. $f(t) = 20$ when t is approximately 0.25 and 3.75 meaning that the ball is 20 feet up at .25 and 3.75 seconds after being hit.

    c. The ball will be at a height of 50 feet at approximately .9 and 3.1 seconds after being hit.

    d. The domain is approximately $[0, 4.1]$ meaning that this function, as described by the graph, takes time inputs from zero to 4.1 seconds. The range is approximately $[0, 67]$ meaning that this function, as described by the graph, outputs heights of the ball ranging from 0 to 67 feet up.