Unit 3 Assessment

Circle the letter of the best answer.

1. What values of x make the expression $(x - 6)(x + 3)$ positive?

   a. $-3 < x < 6$
   b. $6 < x < -3$
   c. $x < -3$ or $x > 6$
   d. $x > -3$ or $x < 6$

2. Solve $x^2 - 7x = -12$ for x.

   a. $x = 3; x = 4$
   b. $x = -4; x = -3$
   c. $x \approx -1.42; x \approx 8.42$
   d. $x \approx -8.43; x \approx 1.42$

3. Solve $4x^2 + 8x + 3 = 0$ for x.

   a. $x = -8.5; x = -7.5$
   b. $x = 7.5; x = 8.5$
   c. $x = 0.5; x = 1.5$
   d. $x = -1.5; x = -0.5$

4. Solve $x^2 + 9x + 20 > 0$ for x.

   a. $x \geq -5$ or $x \leq -4$
   b. $x \leq -5$ or $x \geq -4$
   c. $x > -5$ or $x < -4$
   d. $x < -5$ or $x > -4$

5. What is the equation of a quadratic function in standard form that has zeros $x = 3$ and $x = 5$ and that passes through the point $(-1, 24)$?

   a. $f(x) = 3x^2 - 4x + 4$
   b. $f(x) = x^2 + 8x + 15$
   c. $f(x) = x^2 - 8x + 15$
   d. $f(x) = 3x^2 - 8x + 15$

6. Solve the equation $y = 0.5(x - 6)^2 + 15$ for x in terms of y.

   a. $x = 13 \pm 2\sqrt{y}$
   b. $x = 6 \pm \sqrt{2y - 30}$
   c. $x = \pm 2\sqrt{2y + 21}$
   d. $x = 6 \pm \sqrt{y - 7.5}$

continued

7. The path of a marshmallow launched from a slingshot can be described by the equation $f(x) = -x^2 + 4x + 5$, where $f(x)$ is the height of the marshmallow and x is the number of seconds that have passed since the slingshot's band was released. Which of the following points shows the extremum for the function?

   a. (0, 5)
   b. (2, 9)
   c. (0, –1)
   d. (4, 5)

8. The field hockey team is hosting a battle of the bands to raise money for new equipment. In the past, the profit from the battle of the bands could be modeled by the function $P(x) = -20(x - 20)(x - 10)$, where x represents the ticket price in dollars. What is a reasonable domain for this function?

   a. $-10 \le x \le 20$
   b. $-20 \le x \le -10$
   c. $10 \le x \le 20$
   d. $-20 \le x \le 10$

9. What is the average rate of change of the function $f(x) = 6x^2 + 12x - 4$ between $x = -1$ and $x = 1$?

   a. 12
   b. 24
   c. 4
   d. –12

10. The dimensions of a community garden are such that the length is 6 feet shorter than 3 times its width. What expression describes the area of the community garden in terms of its width, w?

    a. $(w + 3)(w + 6)$ ft^2
    b. $w(6w - 3)$ ft^2
    c. $3w(w - 6)$ ft^2
    d. $w(3w - 6)$ ft^2

11. If the vertex of $f(x)$ is (3, –5), what is the vertex of $f(x + 3)$?

    a. (3, –8)
    b. (6, –5)
    c. (3, –2)
    d. (0, –5)

12. If the transformation of $f(k \bullet x)$ is applied to $f(x)$, with $0 < k < 1$, which is true about the graph of the function?

    a. The graph of the original function is compressed horizontally by a factor of $\frac{1}{k}$.
    b. The graph of the original function is stretched horizontally by a factor of $\frac{1}{k}$.
    c. The graph of the original function is stretched vertically by a factor of k.
    d. The graph of the original function is compressed vertically by a factor of k.

continued

Use what you have learned about quadratic functions to solve each of the following problems.

13. A seagull drops a crab 144 feet onto the rocks below. The function $f(x) = -16x^2 + 144$ is used to model the height of the crab, with $f(x)$ representing the number of feet x seconds after the crab is dropped.

    a. For what values of x is the function $f(x) = -16x^2 + 144$ increasing?

    b. For what values of x is the function $f(x) = -16x^2 + 144$ decreasing?

    c. What is the vertex and what does it mean in terms of this scenario?

    d. What is a reasonable domain for this scenario?

    e. What is the average rate of change in height between 1 and 2.5 seconds after the crab is dropped?

14. The height of a baseball is given by the equation $f(x) = -16x^2 + 32x + 2$, where $f(x)$ represents the height of the baseball in feet and x represents the time in seconds after it was hit by the batter.

    a. What is the vertex and what does it mean in the context of this scenario?

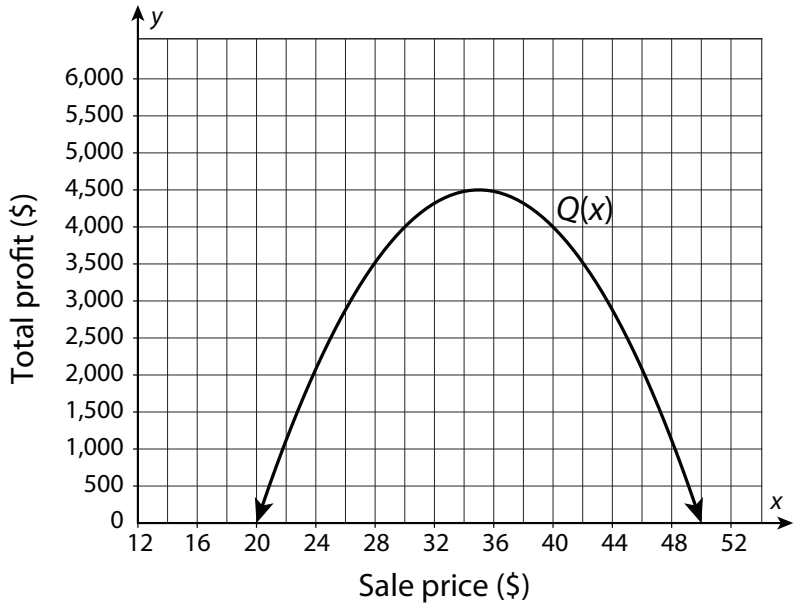
    b. Determine the equation that represents the axis of symmetry for this function.

    c. Create a graph of this scenario.

continued

15. You are a manager at a manufacturing company, and are trying to determine the pricing for a new product. Two different consultants come up with profit prediction functions for different prices. Consultant A's predictions are summarized in the table. Consultant B's predictions are summarized in the graph.

x	$P(x)$
16	0
20	3,200
24	5,120
28	5,760
32	5,120
36	3,200



a. The ideal sale price is the price that maximizes the profit. Which function has a higher ideal sale price?

b. Which function predicts a higher maximum profit?

c. What does the domain represent in the context of the problem? What is a reasonable domain for each function?

d. What does the range represent in the context of the problem? What is a reasonable range for each function?