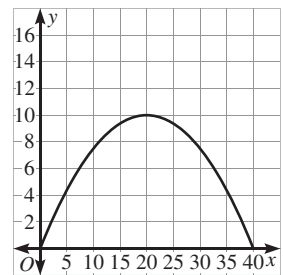


LESSON
9.9**Study Guide***For use with the lesson "Modeling Relationships"***GOAL** Compare representations of linear, exponential, and quadratic functions.**EXAMPLE 1** Sketch a graph of a real-world situation**GOLF** On the first hole, Taylor used her pitching wedge to reach the green. The golf ball reached a maximum height of 10 feet and traveled a horizontal distance of 40 feet before it hit the ground the first time.

- What type of function should you use to represent the path of the golf ball? Sketch a graph of the path of the golf ball.
- In the context of the given situation, describe the intervals in which the function is increasing and decreasing. Explain what these intervals mean in the given situation.

Solution

- The path of the golf ball will be a parabola. Let x represent the horizontal distance in feet and let y represent the vertical distance in feet.
- The function is increasing as x increases from 0 to 20. This is when the golf ball is moving upward until it reaches its maximum height. The function is decreasing as x increases from 20 to 40. This is when the golf ball is descending until it hits the ground.

**Exercises for Example 1****Use the graph in Example 1.**

- What do the intercepts represent?
- What does the maximum point represent?

EXAMPLE 2 Compare properties of two linear functions**Decide which linear function is decreasing at a greater rate.**

- Function 1: The function whose equation is $y = -3x - 8$.
- Function 2: The function with an x -intercept of -1 and a y -intercept of -7 .

Solution

The slope of a linear equation indicates how rapidly the function is increasing or decreasing. The slope of Function 1 is -3 . Calculate the slope of Function 2 using the points $(-1, 0)$ and $(0, -7)$.

$$\frac{-7 - 0}{0 - (-1)} = \frac{-7}{1} = -7$$

So, Function 2 is decreasing more rapidly.

LESSON
9.9**Study Guide** *continued*
*For use with the lesson "Modeling Relationships"***Exercises for Example 2**

3. In Example 2, replace the equation for Function 1 with $y = 9 - 8x$. Now which function is decreasing at a greater rate?
4. Suppose the equation for Function 1 is $y = 2x^2 - 4x + 5$ and the equation for Function 2 is $y = 3x^2 - 6x - 1$. Use a graphing calculator to determine which function has the lesser maximum value.

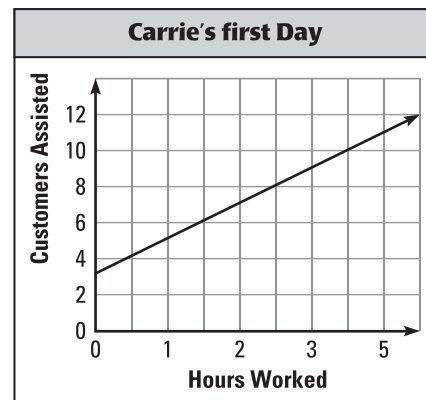
EXAMPLE 3 **Choose a model for a real-world situation**

CUSTOMER SERVICE Carrie just started working in a customer service phone center. While training during her first hour, Carrie was able to provide assistance to 3 customers. After her first hour of training, she began working without supervision. During the remainder of her workday, Carrie was able to increase by 2 the number of customers she assisted each hour over the preceding hour.

- a. Based on the given information, choose an appropriate function to model the number of customers Carrie assisted each hour.
- b. Sketch a graph representing the number of customers Carrie assisted as a function of the number of hours she worked. Identify the function's intercept(s) and interpret the meaning of each intercept in the context of the given situation.

Solution

- a. For every hour she works, Carrie increased the number of customers assisted per hour by 2. The number of customers assisted is increasing by a constant rate. Use a linear function.
- b. Let x represent the number of hours she worked unsupervised and let y represent the number of customers assisted per hour. The y -intercept is 3 and represents the number of customers Carrie assisted while training. The function only makes sense for $x \geq 0$, so there is no x -intercept.

**Exercises for Example 3**

5. **SAVINGS** The table shows the amount of money that Sanjay had in his savings account at the end of four successive years. Based on the change per unit interval, choose an appropriate function to model the situation.

Year	1	2	3	4
Savings (dollars)	1000	1030	1060.90	1092.73