Name _____ Date _____

4.7 Piecewise Functions

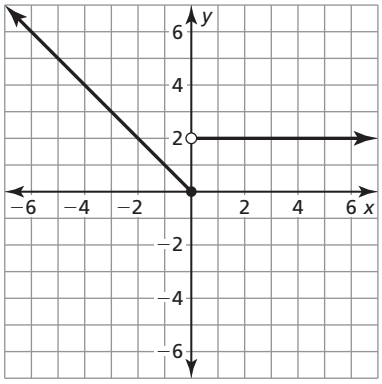
For use with Exploration 4.7

Essential Question How can you describe a function that is represented by more than one equation?

1 EXPLORATION: Writing Equations for a Function

Work with a partner.

a. Does the graph represent y as a function of x? Justify your conclusion.



b. What is the value of the function when $x = 0$? How can you tell?

c. Write an equation that represents the values of the function when $x \leq 0$.

$f(x) =$ _____, if $x \leq 0$

d. Write an equation that represents the values of the function when $x > 0$.

$f(x) =$ _____, if $x > 0$

e. Combine the results of parts (c) and (d) to write a single description of the function.

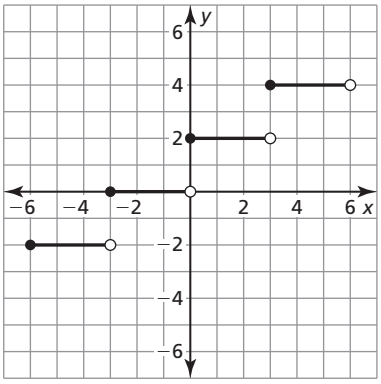
$$f(x) = \begin{cases} \_\_\_\_\_, \text{ if } x \leq 0 \\ \_\_\_\_\_, \text{ if } x > 0 \end{cases}$$

4.7 Piecewise Functions (continued)

2 EXPLORATION: Writing Equations for a Function

Work with a partner.

a. Does the graph represent y as a function of x? Justify your conclusion.

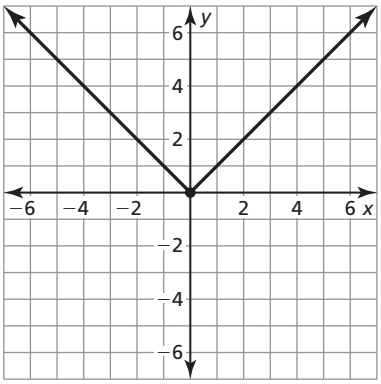


b. Describe the values of the function for the following intervals.

$$f(x) = \begin{cases} \_\_\_\_\_, \text{ if } -6 \le x < -3 \\ \_\_\_\_\_, \text{ if } -3 \le x < 0 \\ \_\_\_\_\_, \text{ if } 0 \le x < 3 \\ \_\_\_\_\_, \text{ if } 3 \le x < 6 \end{cases}$$

Communicate Your Answer

3. How can you describe a function that is represented by more than one equation?



4. Use two equations to describe the function represented by the graph?

Name _____ Date _____

4.7 Notetaking with Vocabulary

For use after Lesson 4.7

In your own words, write the meaning of each vocabulary term.

piecewise function

step function

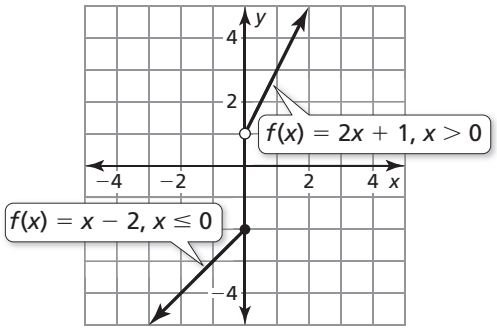
Core Concepts

Piecewise Function

A **piecewise function** is a function defined by two or more equations. Each "piece" of the function applies to a different part of its domain. An example is shown below.

$$f(x) = \begin{cases} x - 2, & \text{if } x \leq 0 \\ 2x + 1, & \text{if } x > 0 \end{cases}$$

- The expression $x - 2$ represents the value of f when x is less than or equal to 0.
- The expression $2x + 1$ represents the value of f when x is greater than 0.



Notes:

Name_____ Date _____

4.7 Notetaking with Vocabulary (continued)

Extra Practice

In Exercise 1–9, evaluate the function.

$$f(x) = \begin{cases} 3x - 1, & \text{if } x \leq 1 \\ 1 - 2x, & \text{if } x > 1 \end{cases}$$

$$g(x) = \begin{cases} 3x - 1, & \text{if } x \leq -3 \\ 2, & \text{if } -3 < x < 1 \\ -3x, & \text{if } x \geq 1 \end{cases}$$

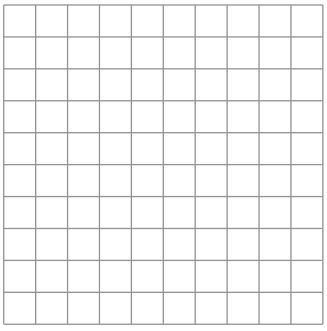
1. $f(0)$ **2.** $f(1)$ **3.** $f(5)$

4. $f(-4)$ **5.** $g(0)$ **6.** $g(-3)$

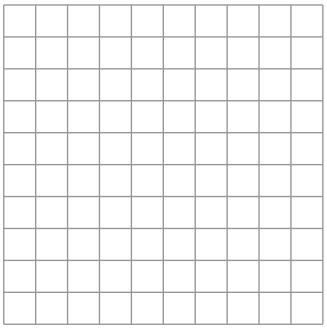
7. $g(1)$ **8.** $g(3)$ **9.** $g(-5)$

In Exercise 10–13, graph the function. Describe the domain and range.

10. $y = \begin{cases} -4x, & \text{if } x \leq 0 \\ 4, & \text{if } x > 0 \end{cases}$



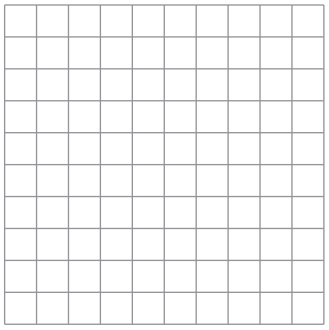
11. $y = \begin{cases} 4 - x, & \text{if } x < 2 \\ x + 3, & \text{if } x \geq 2 \end{cases}$



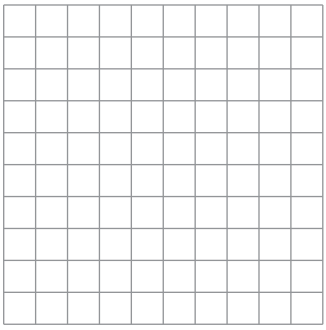
Name _____ Date _____

4.7 Notetaking with Vocabulary (continued)

12. $y = \begin{cases} 2x, & \text{if } x < -2 \\ 2, & \text{if } -2 \le x < 2 \\ -2x, & \text{if } x \ge 2 \end{cases}$

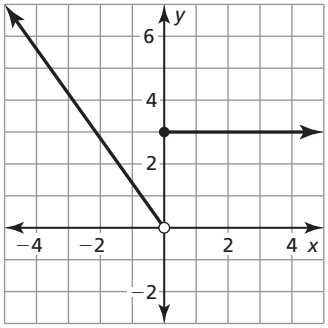


13. $y = \begin{cases} -1, & \text{if } x \le -1 \\ 0, & \text{if } -1 < x < 2 \\ 1, & \text{if } x \ge 2 \end{cases}$

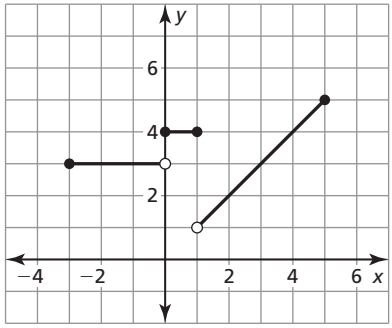


In Exercise 14 and 15, write a piecewise function for the graph.

14.



15.



16. A postal service charges \$4 for shipping any package weighing up to but not including 1 pound and \$1 for each additional pound or portion of a pound up to but not including 5 pounds. Packages 5 pounds or over have different rates. Write and graph a step function that shows the relationship between the number x of pounds a package weighs and the total cost y for postage.