4.7 Start Thinking

Use work at a photo processing facility. The price for processing 50 photos or fewer is \$0.35 per photo. If a customer wants more than 50 photos, the cost is \$18.00 plus \$0.29 per photo.

The situation described above can be thought of as two separate equations. Write a linear equation for each, specifying the domain.

4.7 Warm Up

Evaluate the function.

1. $f(x) = 6x + 2$, if $x = -3$

2. $g(x) = 3x + 4$, if $x = 3$

3. $y = x + 5$, if $x = 3$

4. $y = -3x$, if $x = -2$

5. $f(x) = 4x + 3$, if $x = -3$

6. $g(x) = 5x + 3$, if $x = 5$

4.7 Cumulative Review Warm Up

Graph and compare the two functions.

1. $f(x) = |x| - 3$; $g(x) = |x| - 7$

2. $s(x) = |3x + 4| + 7$; $t(x) = |x + 4| + 7$

3. $v(x) = -|2x - 2| - 3$; $w(x) = 4|2x - 2| + 5$

4. $c(x) = 5|x - 2| + 2$; $d(x) = -\frac{3}{4}|x - 2| - 2$

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4.7 Practice A

In Exercises 1–6, evaluate the function.

$$f(x) = \begin{cases} 2x + 3, & \text{if } x < 0 \\ x - 5, & \text{if } x \geq 0 \end{cases}$$

1. $f(-2)$ **2.** $f(4)$ **3.** $f(1)$

4. $f(0)$ **5.** $f\left(-\frac{1}{2}\right)$ **6.** $f(10)$

7. On a trip, the total distance (in miles) you travel in x hours is represented by the piecewise function

$$d(x) = \begin{cases} 55x, & \text{if } 0 \leq x < 1.5 \\ 82.5, & \text{if } 1.5 \leq x < 4 \\ 82.5 + 320(x - 4), & \text{if } x \geq 4 \end{cases}.$$

a. How far did you travel in 1.5 hours? 3 hours? 4.5 hours?

b. Write a real situation that could be represented by this piecewise function.

In Exercises 8–11, graph the function. Describe the domain and range.

8. $f(x) = \begin{cases} -x, & \text{if } x < 3 \\ x + 4, & \text{if } x \geq 3 \end{cases}$

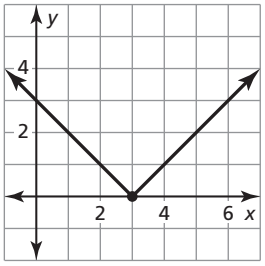
9. $f(x) = \begin{cases} -3x, & \text{if } x \leq -1 \\ 3x, & \text{if } x > -1 \end{cases}$

10. $f(x) = \begin{cases} x + 6, & \text{if } x < -2 \\ -2x, & \text{if } x \geq -2 \end{cases}$

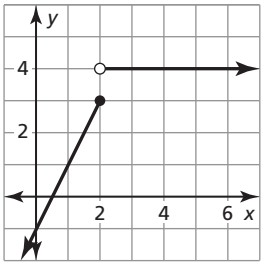
11. $f(x) = \begin{cases} -x + 2, & \text{if } x < 0 \\ x - 2, & \text{if } x \geq 0 \end{cases}$

In Exercises 12 and 13, write a piecewise function for the graph.

12.



13.



In Exercises 14–17, write the absolute value function as a piecewise function.

14. $y = |x| + 3$ **15.** $y = |x| - 2$

16. $y = |x + 1|$ **17.** $y = |x - 4|$

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4.7 Practice B

In Exercises 1–6, evaluate the function.

$$f(x) = \begin{cases} -x + 2, & \text{if } x < -3 \\ 7, & \text{if } -3 \le x < 0 \\ 3x - 1, & \text{if } x \ge 0 \end{cases}$$

1. $f(-5)$ **2.** $f(4)$ **3.** $f(1)$

4. $f(0)$ **5.** $f\left(-\frac{1}{2}\right)$ **6.** $f(-3)$

7. The total cost (in dollars) of ordering graduation announcements is represented by the piecewise function

$$c(x) = \begin{cases} 1.5x + 15, & \text{if } 0 \le x < 25 \\ 1.25x + 15, & \text{if } 25 \le x < 40 \\ x + 15, & \text{if } x \ge 40 \end{cases}.$$

a. Determine the cost of ordering 25 announcements. Then determine the cost of ordering 24 announcements.

b. For what number of announcements less than 25 is it financially better to purchase 25 announcements?

c. For what number of announcements less than 40 is it financially better to purchase 40 announcements?

In Exercises 8–11, graph the function. Describe the domain and range.

8. $f(x) = \begin{cases} -x + 5, & \text{if } x < 5 \\ x - 5, & \text{if } x \ge 5 \end{cases}$

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

10. $f(x) = \begin{cases} -x + 1, & \text{if } x < -3 \\ 4, & \text{if } -3 \le x < 0 \\ 3x + 4, & \text{if } x \ge 0 \end{cases}$

11. $f(x) = \begin{cases} x + 3, & \text{if } x < -2 \\ x - 2, & \text{if } -2 \le x < 2 \\ -2, & \text{if } x \ge 2 \end{cases}$

In Exercises 12–15, write the absolute value function as a piecewise function.

12. $y = |x - 3|$ **13.** $y = -2|x + 4|$

14. $y = -|x + 1| + 3$ **15.** $y = 5|x - 2| + 1$

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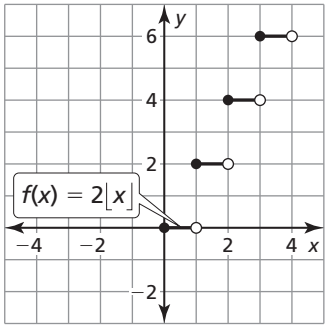
4.7 Enrichment and Extension

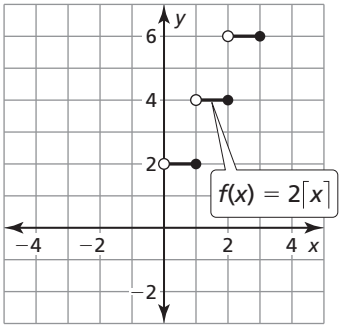
Greatest and Least Integer Functions

For any real number x, $f(x) = \lfloor x \rfloor$ denotes the greatest integer less than or equal to x.
For any real number x, $f(x) = \lceil x \rceil$ denotes the least integer greater than or equal to x.

Example:

$$f(x) = 2\lfloor x \rfloor;\ f(x) = \begin{cases} 0, \text{ if } 0 \le x < 1 \\ 2, \text{ if } 1 \le x < 2 \\ 4, \text{ if } 2 \le x < 3 \end{cases} \ldots \text{ and } f(x) = 2\lceil x \rceil = \begin{cases} 2, \text{ if } 0 < x \le 1 \\ 4, \text{ if } 1 < x \le 2 \\ 6, \text{ if } 2 < x \le 3 \end{cases} \ldots$$





In Exercises 1–6, graph and write an equivalent piecewise function.

1. $f(x) = \lfloor x \rfloor + 3$
2. $f(x) = \lceil x + 3 \rceil$
3. $f(x) = \lceil -x \rceil$
4. $f(x) = -\frac{1}{2}\lfloor x \rfloor$
5. $f(x) = \lfloor 2x \rfloor$
6. $f(x) = \lfloor 3x \rfloor + 2$

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4.7 Puzzle Time

What Do You Call A Nervous Zucchini?

Write the letter of each answer in the box containing the exercise number.

Evaluate the function.

$$f(x) = \begin{cases} 8x - 2, & \text{if } x < -4 \\ 3x - 6, & \text{if } x \geq -4 \end{cases}$$

$$g(x) = \begin{cases} -2x + 5, & \text{if } x \leq -3 \\ 7, & \text{if } -3 < x < 1 \\ 4x - 8, & \text{if } x \geq 1 \end{cases}$$

1. $f(-4)$ **2.** $f(6)$

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

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

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

9. $g(4)$ **10.** $g(-3)$

Answers

E. -6 **N.** 12

E. -50 **Y.** 7

A. -15 **I.** 8

E. -18 **G.** 11

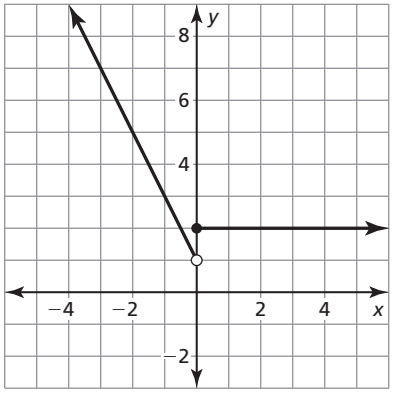
D -4 **G.** 15

V. $f(x) = \begin{cases} -3, & \text{if } x \leq 0 \\ x + 1, & \text{if } x > 0 \end{cases}$

G. $f(x) = \begin{cases} -2x + 1, & \text{if } x < 0 \\ 2, & \text{if } x \geq 0 \end{cases}$

Write a piecewise function for the graph.

11.



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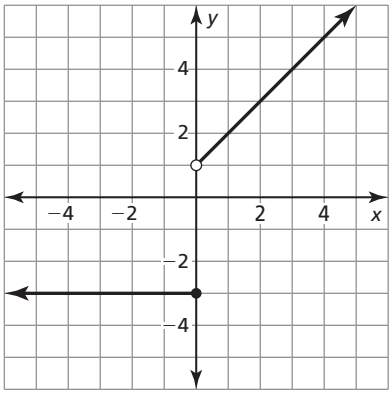

5	2		3	8	11	6		12	4	10	7	9	1