



**UNDERSTAND**

- 10. **Reason** How does changing the sign of the constant  $a$  from positive to negative affect the domain and range of  $f(x) = a|x|$ ?
- 11. **Communicate Precisely** Compare and contrast the graph of  $f(x) = |x|$  and the graph of  $f(x) = x$ . How are they alike? How do they differ?
- 12. **Error Analysis** Describe and correct the error a student made in determining the relationship between the domain and range of  $f(x) = 10|x|$  and  $f(x) = |x|$ .

The domain of  $f(x) = 10|x|$  is the same as the domain of  $f(x) = |x|$ .  
The range of  $f(x) = 10|x|$  is 10 times the range of  $f(x) = |x|$ . **X**

- 13. **Higher Order Thinking** For which values of  $a$  would the graph of  $f(x) = a|x|$  form a right angle at the vertex? Explain.
- 14. **Use Structure** The table shows selected values for the function  $g(x) = a|x|$ . Copy and complete the table. Write any unknown answers in terms of  $a$  and  $b$ .

$x$	$g(x) = a x $
-4	$b$
■	$a$
■	0
1	■
■	$b$
■	$2b$

- 15. **Reason** Consider the function  $f(x) = 2|x|$ .
  - a. Graph  $f$  over the domain  $-4 \leq x \leq 4$ .
  - b. What is the rate of change over the interval  $0 \leq x \leq 4$ ?
  - c. How is the rate of change over this interval related to the form of the function?

**PRACTICE**

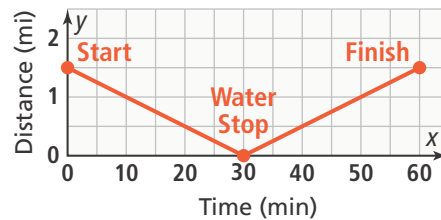
Tell whether each point is on the graph of  $f(x) = |x|$ . If it is, give the coordinates of another point with the same  $y$  value. SEE EXAMPLE 1

- 16. (11, 11)
- 17. (-2.3, -2.3)
- 18. (0, 1)
- 19. (15, -15)
- 20. (-8, 8)
- 21. (1, 0)

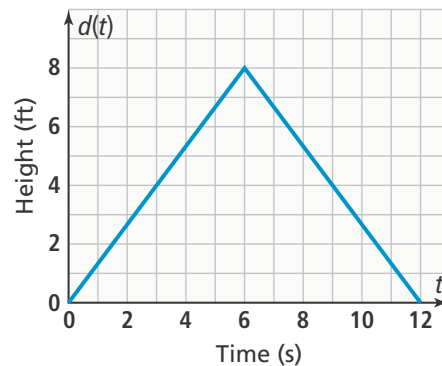
Graph each function. What is the domain and range of each function? SEE EXAMPLE 2

- 22.  $g(x) = -\frac{1}{4}|x|$
- 23.  $h(x) = 3.5|x|$
- 24.  $p(x) = -5|x|$
- 25.  $d(x) = \frac{1}{3}|x|$

- 26. Oscar participates in a charity walk. The graph shows his distance in miles from the water stop as a function of time. How many miles did Oscar walk? Explain your answer. SEE EXAMPLE 3



For the graph shown, find the rate of change over the interval. SEE EXAMPLE 4



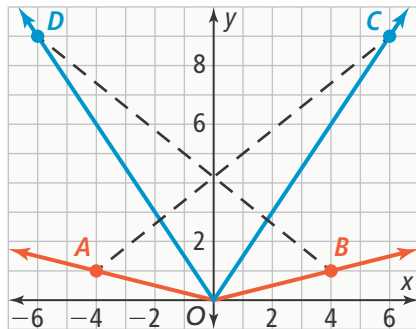
- 27.  $3 \leq t \leq 6$
- 28.  $7 \leq t \leq 10$

For each description, write a function in the form  $g(x) = a|x|$ .

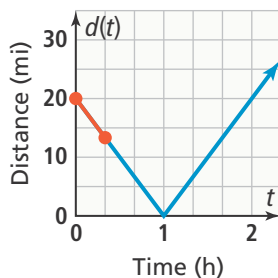
- 29. vertex at (0, 0); passes through (1, 3)
- 30. range is  $y \leq 0$ ; passes through (-1, -4)

**APPLY**

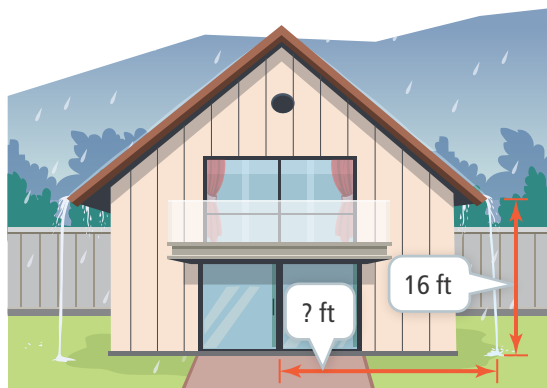
31. **Model With Mathematics** A game designer is looking for two functions to model the solid lines in the figure she constructed. What functions represent the solid lines?



32. **Make Sense and Persevere** The graph shows the distance between a bicyclist and a sandwich shop along her route. Estimate the rate of change over the highlighted interval. What does the rate mean in terms of the situation?

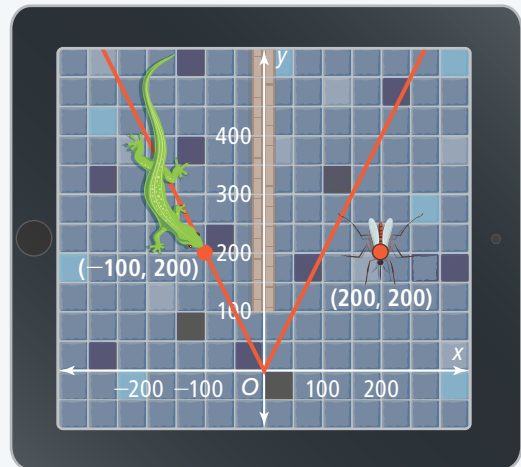


33. **Make Sense and Persevere** The function  $h(x) = -|x| + 34$  models the height of the roof of a house, where  $x$  is the horizontal distance from the center of the house. If a raindrop falls from the end of the roof, how far from the center of the base does it land? Explain your solution.



**ASSESSMENT PRACTICE**

34. The graph of  $f(x) = -0.1|x|$  opens \_\_\_\_\_. The point (\_\_\_\_, -10) is on the graph.
35. **SAT/ACT** For what domain is the range of  $y = -x$  and  $y = -|x|$  the same?
- Ⓐ  $\{x \mid x < 0\}$   
 Ⓑ  $\{x \mid x \leq 0\}$   
 Ⓒ  $\{x \mid x > 0\}$   
 Ⓓ  $\{x \mid x \geq 0\}$   
 Ⓔ all real numbers
36. **Performance Task** The position of a lizard in a video game is modeled on a coordinate plane. The lizard follows the path shown.



- Part A** Write a function that includes an absolute value expression for the position of the lizard.
- Part B** Interpret the graph. Find the vertex and determine the intervals in which the function is increasing, decreasing; and any maximum or minimum values.
- Part C** Where would the function need to intersect the  $x$ -axis so that the lizard can eat the mosquito?
- Part D** Write a function for which the new vertex that you found in Part C is a solution to the function, and allows the lizard to eat the mosquito.