

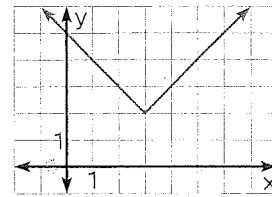
GUIDED PRACTICE

Vocabulary Check ✓

1. What do the coordinates (h, k) represent on the graph of $y = a|x - h| + k$?

Concept Check ✓

2. How do you know if the graph of $y = a|x - h| + k$ opens up or down? How do you know if it is wider, narrower, or the same width as the graph of $y = |x|$?



Ex. 3

3. **ERROR ANALYSIS** Explain why the graph shown is not the graph of $y = |x + 3| + 2$.

Skill Check ✓

Graph the function. Then identify the vertex, tell whether the graph opens up or down, and tell whether the graph is wider, narrower, or the same width as the graph of $y = |x|$.

4. $y = \frac{1}{2}|x|$

5. $y = |x + 5|$

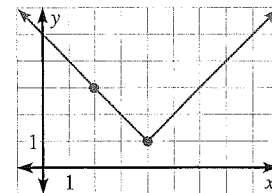
6. $y = |x| - 10$

7. $y = |x| + 5$

8. $y = 2|x + 6| - 10$

9. $y = -|x - \frac{1}{2}| - 14$

10. Write an equation for the function whose graph is shown.



Ex. 10

11. **CAMPING** Suppose that the tent in Example 3 is 7 feet wide and 5 feet tall. Write a function that models the front of the tent. Let the x -axis represent the ground. Then graph the function and identify the domain and range of the function.

PRACTICE AND APPLICATIONS

STUDENT HELP

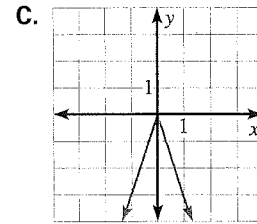
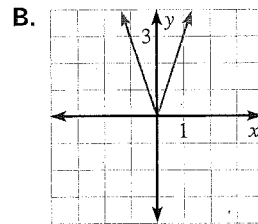
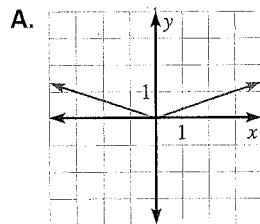
Extra Practice
to help you master skills is on p. 942.

EXAMINING THE EFFECT OF a Match the function with its graph.

12. $f(x) = 3|x|$

13. $f(x) = -3|x|$

14. $f(x) = \frac{1}{3}|x|$

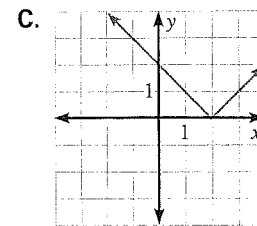
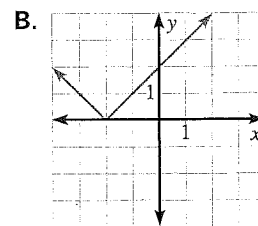
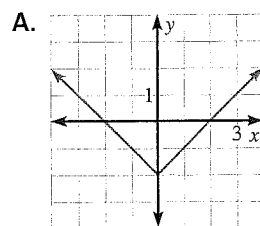


EXAMINING THE EFFECTS OF h AND k Match the function with its graph.

15. $y = |x - 2|$

16. $y = |x| - 2$

17. $y = |x + 2|$



STUDENT HELP

HOMEWORK HELP

Example 1: Exs. 12–25
Example 2: Exs. 34–39
Example 3: Exs. 40–45
Example 4: Exs. 46–48

GRAPHING ABSOLUTE VALUE FUNCTIONS Graph the function. Then identify the vertex, tell whether the graph opens up or down, and tell whether the graph is wider, narrower, or the same width as the graph of $y = |x|$.

18. $y = 6|x - 7|$

19. $y = |x| + 9$

20. $y = -|x - 8| + 1$

21. $y = -|x + 2| + 11$

22. $y = \frac{1}{3}|x - 3| + 4$

23. $y = -2|x + 9| + 3$

24. $y = |x| - \frac{5}{2}$

25. $y = -\frac{1}{2}|x + 6|$

STUDENT HELP



KEYSTROKE HELP

Visit our Web site www.mcdougallittell.com to see keystrokes for several models of calculators.



ABSOLUTE VALUE On many graphing calculators $|x|$ is denoted by $ABS(x)$. Use a graphing calculator to graph the absolute value function. Then use the *Trace* feature to find the corresponding x -value(s) for the given y -value.

26. $y = |x| + 4; y = 10$

27. $y = |x + 14|; y = 9$

28. $y = 15|x|; y = \frac{3}{2}$

29. $y = |x + \frac{4}{7}| - 5; y = 0$

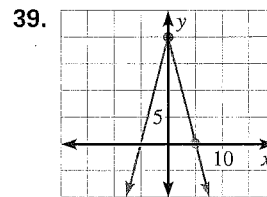
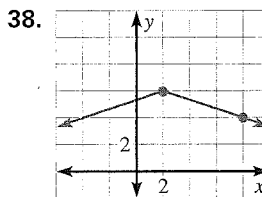
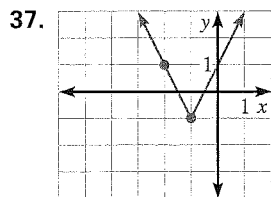
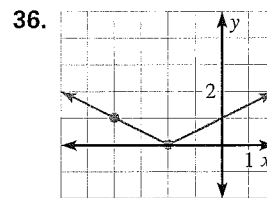
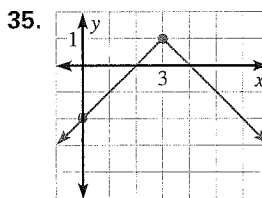
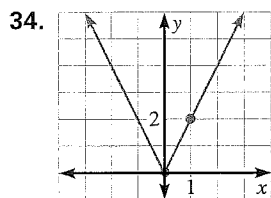
30. $y = -|x - 2| + 5; y = 0.5$

31. $y = -3.2|x| + 7; y = -2$

32. $y = -3.75|x + 1.5| - 5; y = -5$

33. $y = 1.5|x - 3| + 6; y = 8.25$

WRITING EQUATIONS Write an equation of the graph shown.



FOCUS ON APPLICATIONS

WEEK	1	2	3	4	5	6	7	8	9	10	11
Rank	2	1	3	6	6	11	18	9	8	3	3
Artist	—	RAC DOLL	THE LITTLE OLD LADY (From Pasadena)	EVERYBODY LOVES SOMEBODY	WHERE DID OUR LOVE GO...	WISHIN' AND HOPIN'	DANG ME	GET AROUND			
Label & Number	Mercury, Capitol 5553	4 Seasons, Polygram 4721	Decca, Mercury 5574	Decca, Mercury 5571	Decca, Mercury 5568	Decca, Mercury 4427	Decca, Mercury 4427	Decca, Mercury 4427			



MUSIC SINGLES

A musical group's single will change position in the charts from week to week. The Beatles were at No. 1 most often with a total of 22 hit singles.



APPLICATION LINK

www.mcdougallittell.com



MUSIC SINGLES In Exercises 40 and 41, use the following information.

A musical group's new single is released. Weekly sales s (in thousands) increase steadily for a while and then decrease as given by the function $s = -2|t - 20| + 40$ where t is the time (in weeks).

40. Graph the function.

41. What was the maximum number of singles sold in one week?



RAINSTORMS In Exercises 42 and 43, use the following information.

A rainstorm begins as a drizzle, builds up to a heavy rain, and then drops back to a drizzle. The rate r (in inches per hour) at which it rains is given by the function $r = -0.5|t - 1| + 0.5$ where t is the time (in hours).

42. Graph the function.

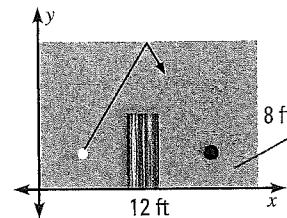
43. For how long does it rain and when does it rain the hardest?

SOUND LEVELS In Exercises 44 and 45, use the following information.

Suppose a musical piece calls for an orchestra to start at *fortissimo* (about 90 decibels), decrease in loudness to *pianissimo* (about 50 decibels) in four measures, and then increase back to *fortissimo* in another four measures. The sound level s (in decibels) of the musical piece can be modeled by the function $s = 10|m - 4| + 50$ where m is the number of measures.

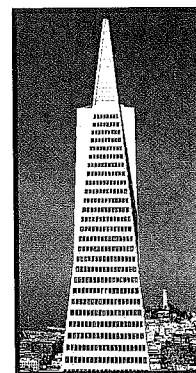
44. Graph the function for $0 \leq m \leq 8$.
45. After how many measures should the orchestra be at the loudness of *mezzo forte* (about 70 decibels)?

46. **MINIATURE GOLF** You are trying to make a hole-in-one on the miniature golf green shown. Imagine that a coordinate plane is placed over the golf green. The golf ball is at $(2.5, 2)$ and the hole is at $(9.5, 2)$. You are going to bank the ball off the side wall of the green at $(6, 8)$. Write an equation for the path of the ball and determine if you make your shot.



47. **REFLECTING SUNLIGHT** You are sitting in a boat on a lake. You can get a sunburn from sunlight that hits you directly and from sunlight that reflects off the water. Sunlight reflects off the water at the point $(2, 0)$ and hits you at the point $(3.5, 3)$. Write and graph the function that shows the path of the sunlight.

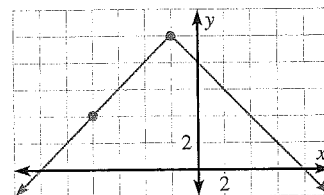
48. **TRANSAMERICA PYRAMID** The Transamerica Pyramid, shown at the right, is an office building in San Francisco. It stands 853 feet tall and is 145 feet wide at its base. Imagine that a coordinate plane is placed over a side of the building. In the coordinate plane, each unit represents one foot, and the origin is at the center of the building's base. Write an absolute value function whose graph is the V-shaped outline of the sides of the building, ignoring the "shoulders" of the building.



49. **MULTIPLE CHOICE** Which statement is true about the graph of the function $y = -|x + 2| + 3$?

- (A) Its vertex is at $(2, 3)$. (B) Its vertex is at $(-2, -3)$.
 (C) It opens down. (D) It is wider than the graph of $y = |x|$.

50. **MULTIPLE CHOICE** Which function is represented by the graph shown?



- (A) $y = -|x - 10| + 2$
 (B) $y = -|x + 10| - 2$
 (C) $y = -|x - 2| - 10$
 (D) $y = -|x + 2| + 10$

GRAPHING Graph the functions.

51. $y = |2x|$ and $y = 2|x|$ 52. $y = |-5x|$ and $y = 5|x|$
 53. $y = |x + 6|$ and $y = |x| + 6$ 54. $y = |x + (-3)|$ and $y = |x| + 3$
 55. Based on your answers to Exercises 51–54, do you think $|ab| = |a| \cdot |b|$ and $|a + b| = |a| + |b|$ are true statements? Explain.

STUDENT HELP

INTERNET **HOMEWORK HELP**
 Visit our Web site
www.mcdougallittell.com
 for help with problem
 solving in Ex. 48.

Test Preparation

★ Challenge

EXTRA CHALLENGE

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