2.7 EXERCISES

HOMEWORK KEY

- ○ = **WORKED-OUT SOLUTIONS** on p. WS4 for Exs. 13, 19, and 39
- ★ = **STANDARDIZED TEST PRACTICE** Exs. 2, 27, 28, 31, 32, 33, 38, and 40
- ❖ = **MULTIPLE REPRESENTATIONS** Ex. 41

SKILL PRACTICE

1. **VOCABULARY** The point (h, k) is the _?_ of the graph of $y = a|x - h| + k$.

2. ★ **WRITING** *Describe* three different types of transformations.

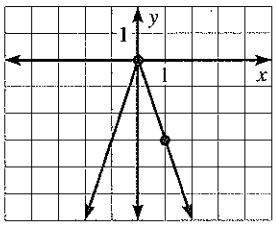
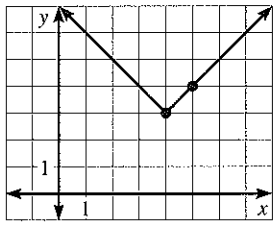
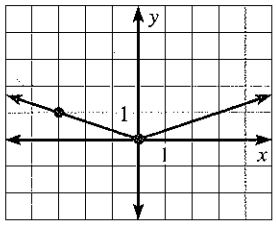
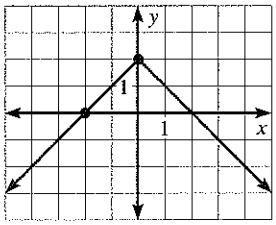
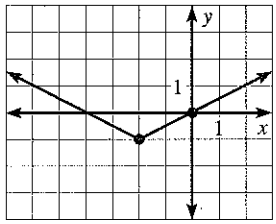
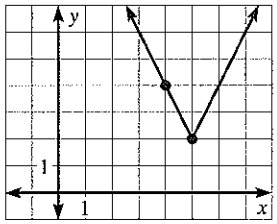
EXAMPLES 1, 2, and 3 on pp. 124–125 for Exs. 3–14

GRAPHING FUNCTIONS **Graph the function. *Compare* the graph with the graph of $y = |x|$.**

3. $y = |x| - 7$
4. $y = |x + 2|$
5. $y = |x + 4| - 2$
6. $f(x) = |x - 1| + 4$
7. $f(x) = 2|x|$
8. $f(x) = -3|x|$
9. $y = -\frac{1}{3}|x|$
10. $y = \frac{3}{4}|x|$
11. $y = 2|x + 1| - 6$
12. $f(x) = -4|x + 2| - 3$
13. $f(x) = -\frac{1}{2}|x - 1| + 5$
14. $f(x) = \frac{1}{4}|x - 4| + 3$

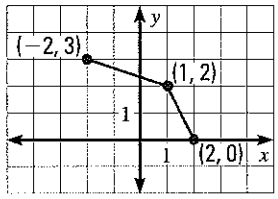
EXAMPLE 4 on p. 125 for Exs. 15–20

WRITING EQUATIONS **Write an equation of the graph.**

15. 
16. 
17. 
18. 
19. 
20. 

EXAMPLE 5 on p. 126 for Exs. 21–28

TRANSFORMATIONS **Use the graph of $y = f(x)$ shown to sketch the graph of the given function.**



21. $y = f(x + 2) - 3$
22. $y = f(x - 4) + 1$
23. $y = \frac{1}{2} \cdot f(x)$
24. $y = -3 \cdot f(x)$
25. $y = -f(x - 1) + 4$
26. $y = 2 \cdot f(x + 3) - 1$

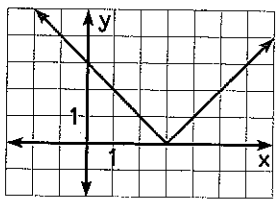
27. ★ **OPEN-ENDED MATH** Create a graph of a function $y = f(x)$. Then sketch the graphs of **(a)** $y = f(x + 3) - 4$, **(b)** $y = 2 \cdot f(x)$, and **(c)** $y = -f(x)$.

28. ★ **MULTIPLE CHOICE** The highest point on the graph of $y = f(x)$ is $(-1, 6)$. What is the highest point on the graph of $y = 4 \cdot f(x - 3) + 5$?

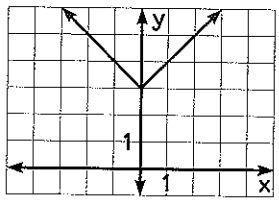
Ⓐ $(-11, 6)$ Ⓑ $(8, 11)$ Ⓒ $(-4, 29)$ Ⓓ $(2, 29)$

ERROR ANALYSIS *Describe* and correct the error in graphing $y = |x + 3|$.

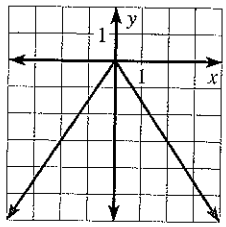
29.



30.



31. ★ **MULTIPLE CHOICE** Which equation has the graph shown?

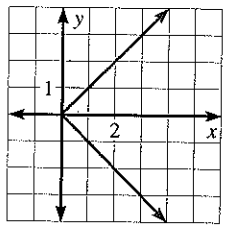


Ⓐ $y = \frac{3}{2}|x|$ Ⓑ $y = \frac{2}{3}|x|$

Ⓒ $y = -\frac{2}{3}|x|$ Ⓓ $y = -\frac{3}{2}|x|$

32. ★ **WRITING** *Describe* how the signs of h and k affect how to obtain the graph of $y = f(x - h) + k$ from the graph of $y = f(x)$.

33. ★ **SHORT RESPONSE** The graph of the relation $x = |y|$ is shown at the right. Is the relation a function? *Explain.*



34. **REASONING** Is it true in general that $|x + h| = |x| + |h|$? *Justify* your answer by considering how the graphs of $y = |x + h|$ and $y = |x| + |h|$ are related to the graph of $y = |x|$.

35. **CHALLENGE** The graph of $y = a|x - h| + k$ passes through $(-2, 4)$ and $(4, 4)$. *Describe* the possible values of h and k for $a \neq 0$.

PROBLEM SOLVING

EXAMPLE 1 on p. 124 for Ex. 36

36. **SPEEDOMETER** A car's speedometer reads 60 miles per hour. The error E in this measurement is $E = |a - 60|$ where a is the actual speed. Graph the function. For what value(s) of a will E be 2.5 miles per hour?

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EXAMPLE 3 on p. 125 for Ex. 37

37. **SALES** Weekly sales s (in thousands) of a new basketball shoe increase steadily for a while and then decrease as described by the function $s = -2|t - 15| + 50$ where t is the time (in weeks). Graph the function. What is the greatest number of pairs of shoes sold in one week?

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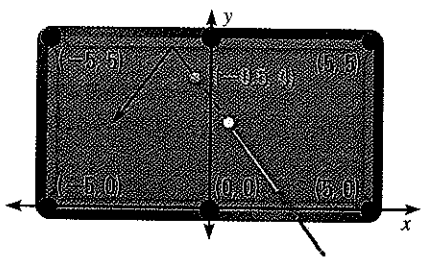
EXAMPLE 4 on p. 125 for Exs. 38–39

38. ★ **SHORT RESPONSE** On the pool table shown, you bank the five ball off the side at $(-1.25, 5)$. You want the ball to go in the pocket at $(-5, 0)$.

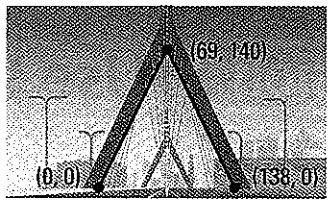


a. Write an equation for the path of the ball.

b. Do you make the shot? *Explain* how you found your answer.

○ = WORKED-OUT SOLUTIONS on p. WS1 ★ = STANDARDIZED TEST PRACTICE ❖ = MULTIPLE REPRESENTATION

39. **ENGINEERING** The Leonard P. Zakim Bunker Hill Bridge spans the Charles River in Boston. The bridge is suspended from two towers. Each tower has the dimensions shown. Write an absolute value function that represents the inverted V-shaped portion of a tower.



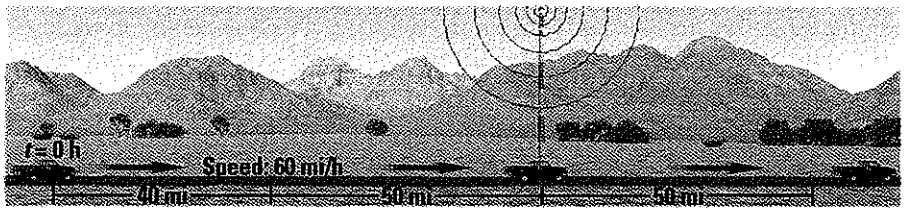
40. ★ **EXTENDED RESPONSE** A snowstorm begins with light snow that increases to very heavy snow before decreasing again. The snowfall rate r (in inches per hour) is given by $r(t) = -0.5|t - 4| + 2$ where t is the time (in hours).

   a. **Graph** Graph the function.

   b. **Interpret** When is the snowfall heaviest? What is the maximum snowfall rate? How are your answers related to the function's graph?

   c. **Extend** The total snowfall is given by the area of the triangle formed by the graph of $r(t)$ and the t-axis. What is the total snowfall?

41. **MULTIPLE REPRESENTATIONS** The diagram shows a truck driving toward a radio station transmitter that has a broadcasting range of 50 miles.



   a. **Making a Table** Make a table that shows the truck's distance d (in miles) from the transmitter after $t = 0$, 0.5, 1, 1.5, 2, 2.5, and 3 hours.

   b. **Drawing a Graph** Use your table from part (a) to draw a graph that shows d as a function of t.

   c. **Writing an Equation** Write an equation that gives d as a function of t. During what driving times is the truck within range of the transmitter?

42. **CHALLENGE** A hiker walks up and down a hill. The hill has a cross section that can be modeled by $y = -\frac{4}{3}|x - 300| + 400$ where x and y are measured in feet and $0 \le x \le 600$. How far does the hiker walk?

MIXED REVIEW

PREVIEW
Prepare for Lesson 2.8 in Exs. 43–48.

Solve the inequality. Then graph the solution. *(p. 41)*

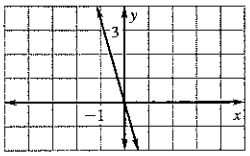
43. $5x - 17 \ge 13$
44. $8 - 3x > -13$
45. $2x - 5 < 6x + 9$
46. $4x + 6 \le x - 18$
47. $11 \le 2x - 5 \le 25$
48. $x + 5 \le -1$ or $x - 3 > 4$

Graph the equation. *(p. 89)*

49. $y = -x + 6$
50. $y = -4x + 3$
51. $y = 2x - 5$
52. $y = -3$
53. $y = 1.5x + 2$
54. $y = 3x - 1$

55. **DONATIONS** The number d of donations a charity receives varies directly with the number r of requests it mails. The charity sends out 9500 requests and receives 420 donations. Write an equation that relates r and d. *(p. 107)*

5. $y = -3.5x$



11. $y = 2x$; 24 **13.** $y = -0.2x$; -2.4 **15.** $y = \frac{1}{3}x$; 4

19. not direct variation **21.** direct variation; 2.5

23. direct variation; $\frac{1}{6}$ **25.** $y = -\frac{4}{3}x$; 3 **27.** $y = -7x$; $\frac{4}{7}$

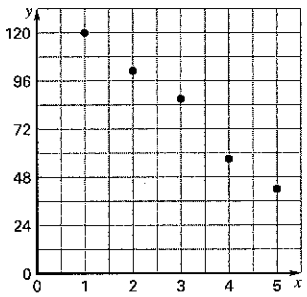
29. $y = -7.2x$; $\frac{5}{9}$ **31.** direct variation; $y = -\frac{1}{3}x$

33. direct variation; $y = -4x$ **35.** The quotients need to be compared to each other, not the products; $\frac{24}{1} = 24$, $\frac{12}{2} = 6$, $\frac{8}{3} \approx 2.7$, $\frac{6}{4} = 1.5$, because the ratios are not equal, the data do not show direct variation.

2.5 Problem Solving (pp. 110–111) **39.** $w = 3600d$; 6300 lb **41.** direct variation; $t = 5.1s$ **43. a.** direct variation; $P = 4s$ **b.** Not a direct variation; the ratios of A to s are not equal. **c.** Not a direct variation; the ratios of A to P are not equal.

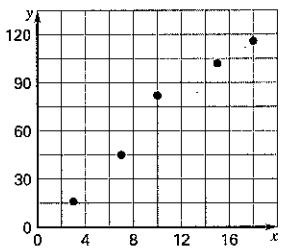
2.6 Skill Practice (pp. 117–118) **1.** best-fitting line **3.** negative correlation **5.** approximately no correlation **7.** 0 **9.** -1

11. a.



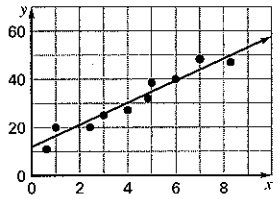
b. *Sample answer:* $y = -20x + 141$
c. about -259

13. a.

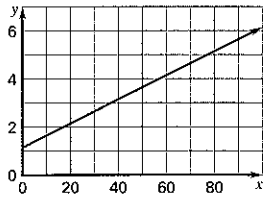


b. *Sample answer:* $y = 6.7x + 1$
c. about 135

17. The line should go through the middle of the data points. *Sample answer:*



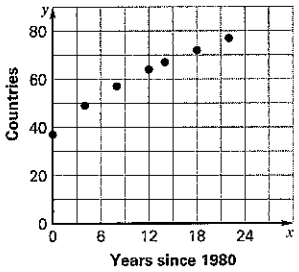
19. $y = 0.05x + 1.14$



21. a. *Sample answer:* Measuring the depth of water at different times while filling a swimming pool. The number of gallons of milk you buy and the total cost. **b.** *Sample answer:* The age of a car and its current value. The number of miles you have driven since you last put gas in the tank and the amount of gas left in the tank. **c.** *Sample answer:* The height of a person and the month they were born. The age of a person and the number of vehicles they own.

2.6 Problem Solving (pp. 119–120) **25.** *Sample answer:* $y = 101.3x + 2236.6$ **27. a.** (0, 37), (4, 49), (8, 57), (12, 64), (14, 67), (18, 72), (22, 77)

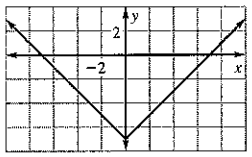
b.



c. *Sample answer:* $y = 1.8x + 40.7$; 102 countries

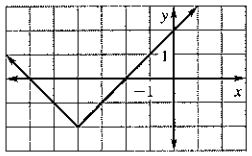
2.7 Skill Practice (pp. 127–128) **1.** vertex

3.



translated down 7 units

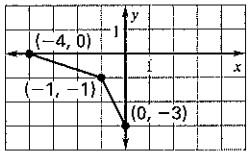
5.



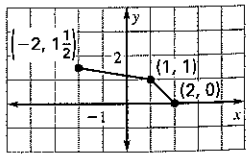
translated left 4 units and down 2 units

15. $y = -3|x|$ **17.** $y = \frac{1}{3}|x|$ **19.** $y = \frac{1}{2}|x + 2| - 1$

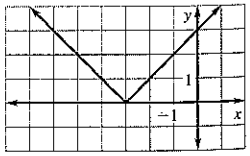
21.



23.



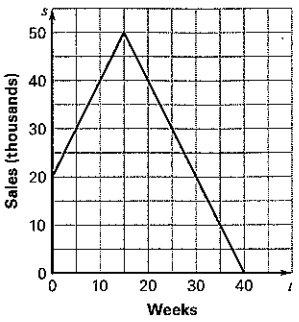
29. The graph should be translated left 3 units.



33. No. *Sample answer:* It does not pass the vertical line test.

SELECTED ANSWERS

2.7 Problem Solving (pp. 128–129)

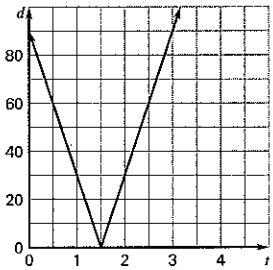
37. 

50,000 pairs of shoes

39. $y = -\frac{140}{69}|x - 69| + 140$

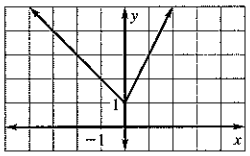
41. a.

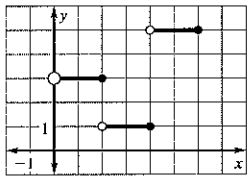
t	0	0.5	1	1.5	2	2.5	3
d	90	60	30	0	30	60	90

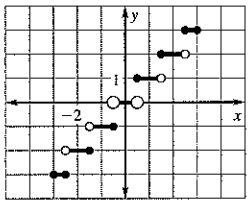
b. 

c. $d = 60|t - 1.5|$; $\frac{2}{3} \le t \le 2\frac{1}{3}$

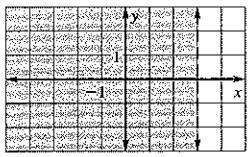
Extension (p. 131) **1.** -1 **3.** $\frac{5}{2}$

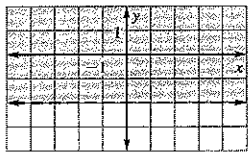
5. 

7. 

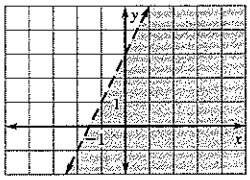
9. 

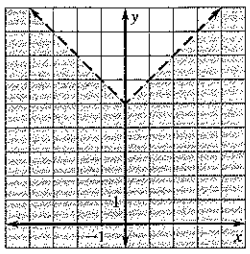
2.8 Skill Practice (pp. 135–136) **1.** half-plane **3.** solution, not a solution **5.** solution, solution

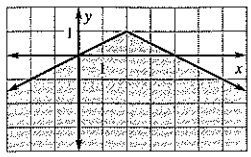
7. 

9. 

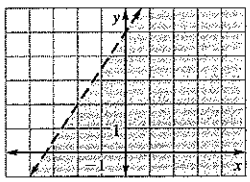
19. The boundary line should be a dashed line.

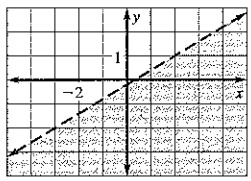


23. 

25. 

29. solution, not a solution **31.** solution, not a solution

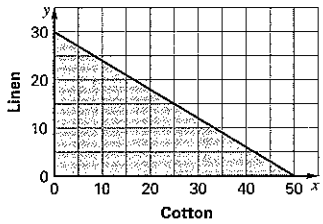
33. 

35. 

39. *Sample answer:* $y > x + 3$ **41.** $y > -\frac{3}{5}x + 3$; pick two points on the boundary line to find the slope and then use the point-slope form of an equation to find the equation. The boundary line is dotted, so the inequality dos not include points on the boundary. Then choose a point to determine which inequality sign to use. *Sample answer:* You and your sister want to spend at least \$15 on your little brother's birthday. You want to buy him some racecars that cost \$3 each and some building block sets that cost \$5 each.

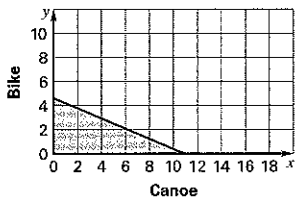
2.8 Problem Solving (pp. 137–138) **43.** $0.03x + 0.06y \le 20$

45. $1.5x + 2.5y \le 75$



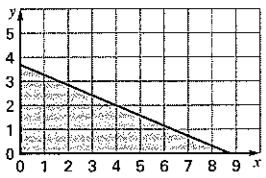
$y \le 15.6$ yd

47. a. $11x + 26y \le 120$



b. *Sample answer:* 2 days canoeing and 5 days biking, 3 days canoeing and 2 days biking, 2 days canoeing and 2 days biking

c. $11x + 26y \le 96$
Sample answer: 1 day canoeing and 3 days biking, 4 days canoeing and 2 days biking, 2 days canoeing and 2 days biking



SELECTED ANSWERS