GUIDED PRACTICE

Vocabulary Check ✓

1. Define piecewise function and step function. Give an example of each.

Concept Check ✓

2. Look back at Example 3. What does a solid dot on the graph of a step function indicate? What does an open dot indicate?

Tell whether the statement is *True* or *False*. Explain.

3. In the graph of a piecewise function, the separate pieces are always connected.

4. $f(x) = \begin{cases} 2, & \text{if } 1 \le x < 2 \\ 4, & \text{if } 2 \le x < 3 \\ 6, & \text{if } 3 \le x < 4 \end{cases}$ can be rewritten as $f(x) = 2[\![x]\!]$, $1 \le x < 4$.

Skill Check ✓

Evaluate $f(x) = \begin{cases} 3x - 1, & \text{if } x \le 4 \\ 2x + 7, & \text{if } x > 4 \end{cases}$ for the given value of x.

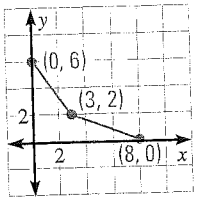
5. $x = 10$ 6. $x = -\frac{1}{3}$ 7. $x = 4$ 8. $x = -2$

Graph the function.

9. $f(x) = \begin{cases} 2x + 1, & \text{if } x < 1 \\ -x + 4, & \text{if } x \ge 1 \end{cases}$

10. $f(x) = \begin{cases} 4, & \text{if } 0 \le x < 2 \\ 5, & \text{if } 2 \le x < 4 \\ 6, & \text{if } 4 \le x < 6 \end{cases}$

11. Write equations for the piecewise function whose graph is shown.



Ex. 11

12. **PARKING RATES** The weekday parking rates for a garage are shown. Write and graph a piecewise function for the weekday parking charges at that garage.

Garage Rates (Weekdays)
$3 per half hour
$18 maximum for 12 hours

PRACTICE AND APPLICATIONS

STUDENT HELP

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

EVALUATING FUNCTIONS Evaluate the function for the given value of x.

$f(x) = \begin{cases} 5x - 1, & \text{if } x < -2 \\ x - 9, & \text{if } x \ge -2 \end{cases}$

13. $f(-4)$ 14. $f(-2)$ 15. $f(0)$ 16. $f(5)$

$h(x) = \begin{cases} \frac{1}{2}x - 10, & \text{if } x \le 6 \\ -x - 1, & \text{if } x > 6 \end{cases}$

17. $h(1)$ 18. $h(-10)$ 19. $h(6)$ 20. $h(0)$

GRAPHING FUNCTIONS Graph the function.

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

22. $f(x) = \begin{cases} x + 6, & \text{if } x \le -3 \\ -\frac{2}{3}x - 3, & \text{if } x > -3 \end{cases}$

23. $f(x) = \begin{cases} 2x + 13, & \text{if } x \ge -5 \\ x + \frac{1}{2}, & \text{if } x < -5 \end{cases}$

24. $f(x) = \begin{cases} -x, & \text{if } x > 2 \\ x - 4, & \text{if } x \le 2 \end{cases}$

25. $f(x) = \begin{cases} 3x - 14, & \text{if } x \le 4 \\ -2x + 6, & \text{if } x > 4 \end{cases}$

26. $f(x) = \begin{cases} x - 8, & \text{if } x < 9 \\ \frac{1}{3}x - 2, & \text{if } x \ge 9 \end{cases}$

STUDENT HELP

HOMEWORK HELP

Example 1: Exs. 13–20
Example 2: Exs. 21–26
Example 3: Exs. 27–32
Example 4: Exs. 35–40
Examples 5 and 6: Exs. 50–59

GRAPHING STEP FUNCTIONS Graph the step function.

27. $f(x) = \begin{cases} 3, & \text{if } -1 \le x < 2 \\ 5, & \text{if } 2 \le x < 4 \\ 8, & \text{if } 4 \le x < 9 \\ 10, & \text{if } 9 \le x < 12 \end{cases}$

28. $f(x) = \begin{cases} 6.5, & \text{if } -4 \le x < -2 \\ 4.1, & \text{if } -2 \le x < 1 \\ 0.9, & \text{if } 1 \le x < 3 \\ -2.1, & \text{if } 3 \le x < 6 \end{cases}$

29. $f(x) = \begin{cases} -1, & \text{if } 0 \le x < 1 \\ -3, & \text{if } 1 \le x < 2 \\ -5, & \text{if } 2 \le x < 3 \\ -7, & \text{if } 3 \le x < 4 \\ -9, & \text{if } 4 \le x < 5 \end{cases}$

30. $f(x) = \begin{cases} 4, & \text{if } -10 < x \le -8 \\ 6, & \text{if } -8 < x \le -6 \\ 8, & \text{if } -6 < x \le -4 \\ 9.1, & \text{if } -4 < x \le -2 \\ 10, & \text{if } -2 < x \le 0 \end{cases}$

SPECIAL STEP FUNCTIONS Graph the special step function. Then explain how you think the function got its name.

31. CEILING FUNCTION

$$f(x) = \lceil x \rceil = \begin{cases} \cdots \\ 1, & \text{if } 0 < x \le 1 \\ 2, & \text{if } 1 < x \le 2 \\ 3, & \text{if } 2 < x \le 3 \\ \cdots \end{cases}$$

32. ROUNDING FUNCTION

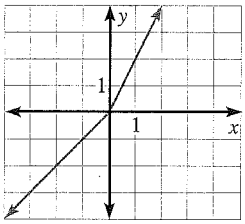
$$f(x) = \text{ROUND}(x) = \begin{cases} \cdots \\ 1, & \text{if } 0.5 \le x < 1.5 \\ 2, & \text{if } 1.5 \le x < 2.5 \\ 3, & \text{if } 2.5 \le x < 3.5 \\ \cdots \end{cases}$$

33. CRITICAL THINKING Look back at Example 2. How would the graph of the function change if $<$ was replaced with $\le$ and $\ge$ was replaced with $>$? Explain your answer.

34. CRITICAL THINKING Look back at Example 3. How would the graph of the function change if each $\le$ was replaced with $<$ and each $<$ was replaced with $\le$? Explain your answer.

WRITING PIECEWISE FUNCTIONS Write equations for the piecewise function whose graph is shown.

35.



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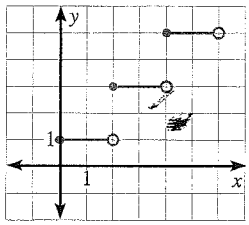

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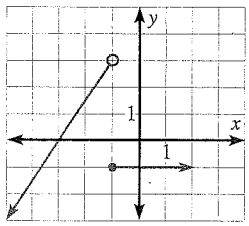

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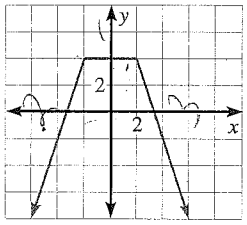

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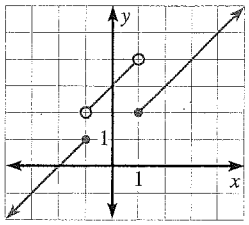

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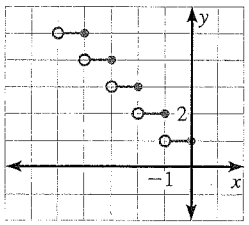

STUDENT HELP

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

GREATEST INTEGER FUNCTION On many graphing calculators $[\![x]\!]$ is denoted by int(x). Use a graphing calculator to graph the function.

41. $g(x) = [\![x]\!]$

42. $g(x) = [\![2x]\!]$

43. $g(x) = [\![x]\!] - 1$

44. $g(x) = [\![x + 3]\!]$

45. $g(x) = 6[\![x]\!]$

46. $g(x) = [\![3x]\!] + 4$

47. $g(x) = 4[\![x + 7]\!]$

48. $g(x) = -[\![x]\!]$

49. $g(x) = 3[\![x - 2]\!] + 5$