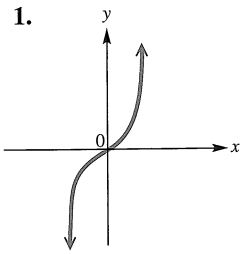
cises

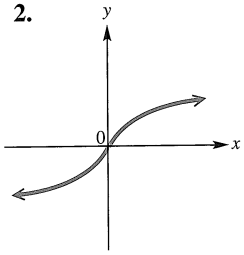
$(-\infty, \infty)$
$-\infty, 0]$
$\infty)$
$\infty)$
8. G; $[0, \infty)$
10. C; $x = y^2$
12. B; 1

Determine the intervals of the domain over which each function is continuous. See Example 1.

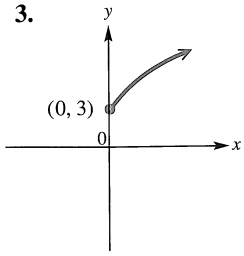
1.



2.



3.



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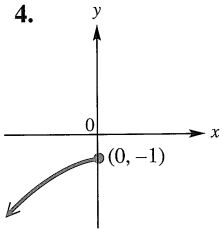

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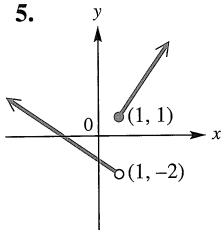
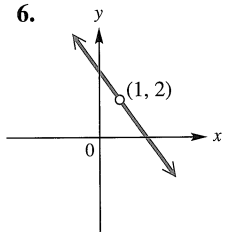
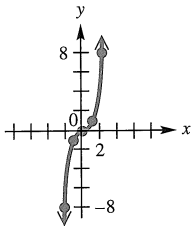


6.

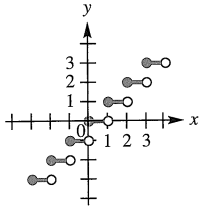


Concept Check *For Exercises 7–16, refer to the following basic graphs.*

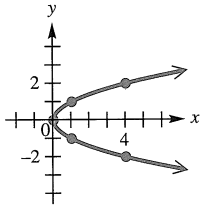
A.



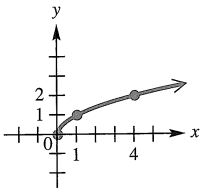
B.



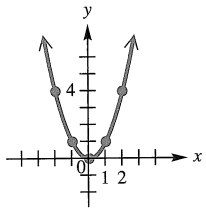
C.



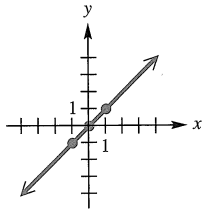
D.



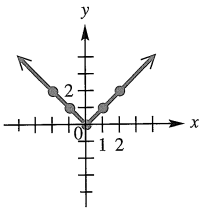
E.



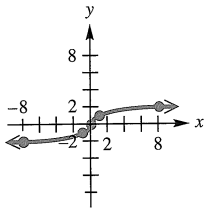
F.



G.



H.



7. Which one is the graph of $y = x^2$? What is its domain?

8. Which one is the graph of $y = |x|$? On what interval is it increasing?

9. Which one is the graph of $y = x^3$? What is its range?

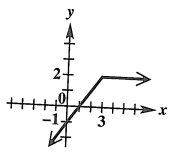
10. Which one is not the graph of a function? What is its equation?

11. Which one is the identity function? What is its equation?

12. Which one is the graph of $y = [\![x]\!]$? What is the value of y when $x = 1.5$?

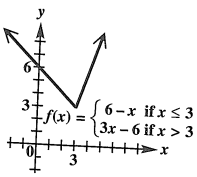
13. H; no **14.** D; $[0, \infty)$
15. B;
$\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$
16. E and G; $[0, \infty)$; $(-\infty, 0]$
17. (a) -10 (b) -2 (c) -1
(d) 2 **18.** (a) -7 (b) -3
(c) -2 (d) 2 **19.** (a) -3 (b) 1
(c) 0 (d) 9 **20.** (a) 10 (b) -4
(c) -1 (d) -12

21.



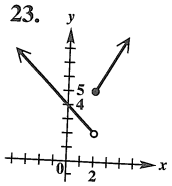
$f(x) = \begin{cases} x - 1 & \text{if } x \le 3 \\ 2 & \text{if } x > 3 \end{cases}$

22.



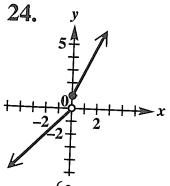
$f(x) = \begin{cases} 6 - x & \text{if } x \le 3 \\ 3x - 6 & \text{if } x > 3 \end{cases}$

23.



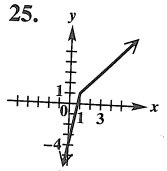
$f(x) = \begin{cases} 4 - x & \text{if } x < 2 \\ 1 + 2x & \text{if } x \ge 2 \end{cases}$

24.



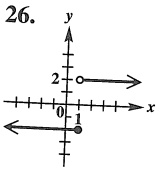
$f(x) = \begin{cases} 2x + 1 & \text{if } x \ge 0 \\ x & \text{if } x < 0 \end{cases}$

25.



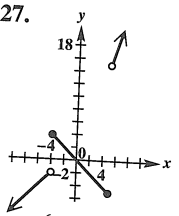
$f(x) = \begin{cases} 5x - 4 & \text{if } x \le 1 \\ x & \text{if } x > 1 \end{cases}$

26.



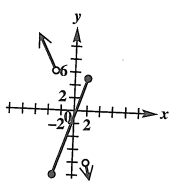
$f(x) = \begin{cases} -2 & \text{if } x \le 1 \\ 2 & \text{if } x > 1 \end{cases}$

27.



$(x) = \begin{cases} 2 + x & \text{if } x < -4 \\ -x & \text{if } -4 \le x \le 5 \\ 3x & \text{if } x > 5 \end{cases}$

28.



$f(x) = \begin{cases} -2x & \text{if } x < -3 \\ 3x - 1 & \text{if } -3 \le x \le 2 \\ -4x & \text{if } x > 2 \end{cases}$

13. Which one is the graph of $y = \sqrt[3]{x}$? Is there any interval over which the function is decreasing?

14. Which one is the graph of $y = \sqrt{x}$? What is its domain?

15. Which one is discontinuous at many points? What is its range?

16. Which graphs of functions decrease over part of the domain and increase over the rest of the domain? On what intervals do they increase? decrease?

For each piecewise-defined function, find **(a)** $f(-5)$, **(b)** $f(-1)$, **(c)** $f(0)$, *and* **(d)** $f(3)$. *See Example 2.*

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

18. $f(x) = \begin{cases} x - 2 & \text{if } x < 3 \\ 5 - x & \text{if } x \ge 3 \end{cases}$

19. $f(x) = \begin{cases} 2 + x & \text{if } x < -4 \\ -x & \text{if } -4 \le x \le 2 \\ 3x & \text{if } x > 2 \end{cases}$

20. $f(x) = \begin{cases} -2x & \text{if } x < -3 \\ 3x - 1 & \text{if } -3 \le x \le 2 \\ -4x & \text{if } x > 2 \end{cases}$

Graph each piecewise-defined function. See Example 2.

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

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

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

24. $f(x) = \begin{cases} 2x + 1 & \text{if } x \ge 0 \\ x & \text{if } x < 0 \end{cases}$

25. $f(x) = \begin{cases} 5x - 4 & \text{if } x \le 1 \\ x & \text{if } x > 1 \end{cases}$

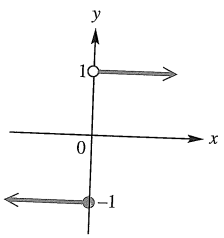
26. $f(x) = \begin{cases} -2 & \text{if } x \le 1 \\ 2 & \text{if } x > 1 \end{cases}$

27. $f(x) = \begin{cases} 2 + x & \text{if } x < -4 \\ -x & \text{if } -4 \le x \le 5 \\ 3x & \text{if } x > 5 \end{cases}$

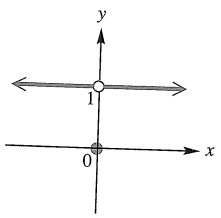
28. $f(x) = \begin{cases} -2x & \text{if } x < -3 \\ 3x - 1 & \text{if } -3 \le x \le 2 \\ -4x & \text{if } x > 2 \end{cases}$

Concept Check *Give a rule for each piecewise-defined function. Also give the domain and range.*

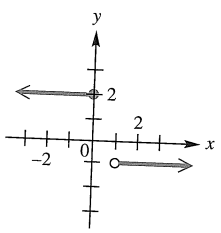
29.



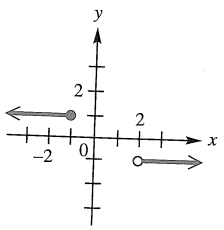
30.



31.



32.



Graph each function. Give the domain and range. See Example 3.

33. $f(x) = [\![-x]\!]$ **34.** $f(x) = [\![2x]\!]$ **35.** $g(x) = [\![2x - 1]\!]$

36. *Concept Check* If x is an even integer and $f(x) = [\![\frac{1}{2}x]\!]$, how would you describe the function value?

(Modeling) *Solve each problem. See Example 4.*

37. *Postage Charges* Assume that postage rates are 37¢ for the first ounce, plus 23¢ for each additional ounce, and that each letter carries one 37¢ stamp and as many 23¢ stamps as necessary. Graph the function f that models the number of stamps on a letter weighing x ounces over the interval $(0, 5]$.

38. *Airport Parking Charges* The cost of parking a car at an airport hourly parking lot is \$3 for the first half-hour and \$2 for each additional half-hour or fraction of a half-hour. Graph the function f that models the cost of parking a car for x hours over the interval $(0, 2]$.

Match each piecewise-defined function with its calculator graph. (All graphs are shown in dot mode.)

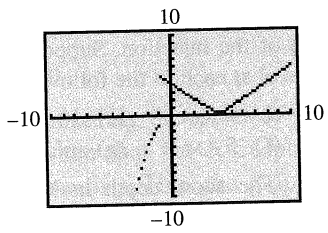
39. $f(x) = \begin{cases} x^2 - 4 & \text{if } x \geq 0 \\ -x + 5 & \text{if } x < 0 \end{cases}$

40. $g(x) = \begin{cases} |x - 4| & \text{if } x \geq -1 \\ -x^2 & \text{if } x < -1 \end{cases}$

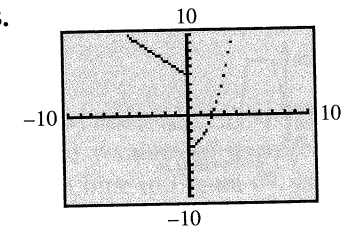
41. $h(x) = \begin{cases} 6 & \text{if } x \geq 0 \\ -6 & \text{if } x < 0 \end{cases}$

42. $k(x) = \begin{cases} \sqrt{x} & \text{if } x \geq 0 \\ -x^2 & \text{if } x < 0 \end{cases}$

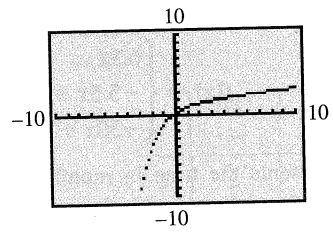
A.



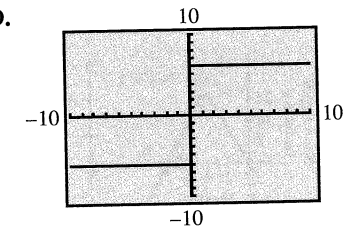
B.



C.

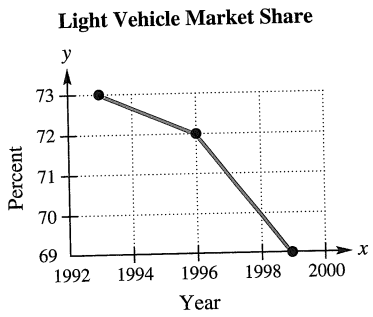


D.



(Modeling) *Solve each problem.*

43. *Light Vehicle Market Share* The light vehicle market share (in percent) in the U.S. for domestic cars is shown in the graph. Let $x = 3$ represent 1993, $x = 6$ represent 1996, and so on.



Source: J.D. Power & Associates.

(a) Use the points on the graph to write equations for the line segments in the intervals $[3, 6]$ and $(6, 9]$.

(b) Define $f(x)$ for the piecewise-defined function.