

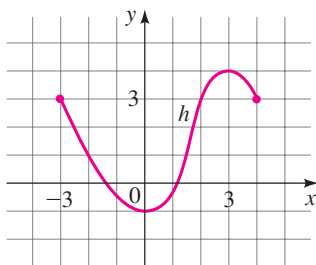
## 2.2 Exercises

1–22 ■ Sketch the graph of the function by first making a table of values.

- |  |                              |
|--|------------------------------|
| 1. $f(x) = 2$                                    | 2. $f(x) = -3$               |
| 3. $f(x) = 2x - 4$                               | 4. $f(x) = 6 - 3x$           |
| 5. $f(x) = -x + 3, \quad -3 \leq x \leq 3$       |                              |
| 6. $f(x) = \frac{x-3}{2}, \quad 0 \leq x \leq 5$ |                              |
| 7. $f(x) = -x^2$                                 | 8. $f(x) = x^2 - 4$          |
| 9. $g(x) = x^3 - 8$                              | 10. $g(x) = 4x^2 - x^4$      |
| 11. $g(x) = \sqrt{x+4}$                          | 12. $g(x) = \sqrt{-x}$       |
| 13. $F(x) = \frac{1}{x}$                         | 14. $F(x) = \frac{1}{x+4}$   |
| 15. $H(x) =  2x $                                | 16. $H(x) =  x+1 $           |
| 17. $G(x) =  x  + x$                             | 18. $G(x) =  x  - x$         |
| 19. $f(x) =  2x - 2 $                            | 20. $f(x) = \frac{x}{ x }$   |
| 21. $g(x) = \frac{2}{x^2}$                       | 22. $g(x) = \frac{ x }{x^2}$ |

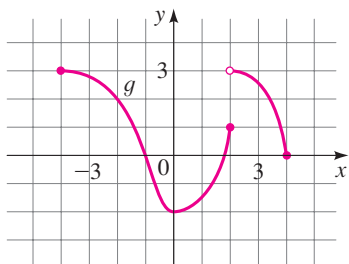
23. The graph of a function  $h$  is given.

- (a) Find  $h(-2)$ ,  $h(0)$ ,  $h(2)$ , and  $h(3)$ .  
 (b) Find the domain and range of  $h$ .



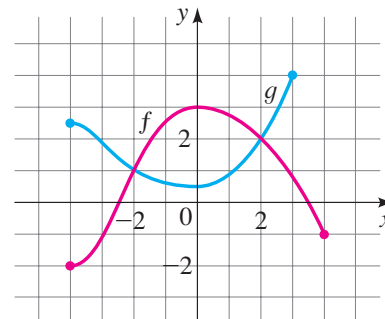
24. The graph of a function  $g$  is given.

- (a) Find  $g(-4)$ ,  $g(-2)$ ,  $g(0)$ ,  $g(2)$ , and  $g(4)$ .  
 (b) Find the domain and range of  $g$ .



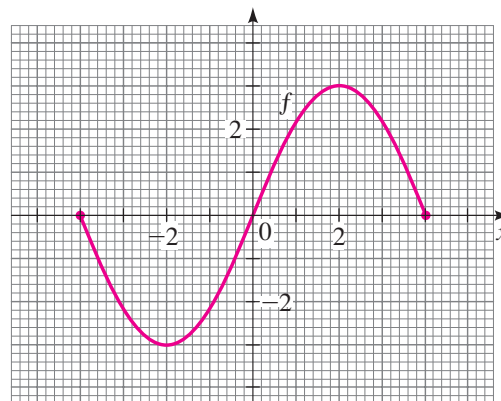
25. Graphs of the functions  $f$  and  $g$  are given.

- (a) Which is larger,  $f(0)$  or  $g(0)$ ?  
 (b) Which is larger,  $f(-3)$  or  $g(-3)$ ?  
 (c) For which values of  $x$  is  $f(x) = g(x)$ ?



26. The graph of a function  $f$  is given.

- (a) Estimate  $f(0.5)$  to the nearest tenth.  
 (b) Estimate  $f(3)$  to the nearest tenth.  
 (c) Find all the numbers  $x$  in the domain of  $f$  for which  $f(x) = 1$ .



27–36 ■ A function  $f$  is given.

- (a) Use a graphing calculator to draw the graph of  $f$ .  
 (b) Find the domain and range of  $f$  from the graph.

- |                              |                               |
|------------------------------|-------------------------------|
| 27. $f(x) = x - 1$           | 28. $f(x) = 2(x + 1)$         |
| 29. $f(x) = 4$               | 30. $f(x) = -x^2$             |
| 31. $f(x) = 4 - x^2$         | 32. $f(x) = x^2 + 4$          |
| 33. $f(x) = \sqrt{16 - x^2}$ | 34. $f(x) = -\sqrt{25 - x^2}$ |
| 35. $f(x) = \sqrt{x - 1}$    | 36. $f(x) = \sqrt{x + 2}$     |

37–50 ■ Sketch the graph of the piecewise defined function.

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

38.  $f(x) = \begin{cases} 1 & \text{if } x \leq 1 \\ x + 1 & \text{if } x > 1 \end{cases}$

39.  $f(x) = \begin{cases} 3 & \text{if } x < 2 \\ x - 1 & \text{if } x \geq 2 \end{cases}$

40.  $f(x) = \begin{cases} 1 - x & \text{if } x < -2 \\ 5 & \text{if } x \geq -2 \end{cases}$

41.  $f(x) = \begin{cases} x & \text{if } x \leq 0 \\ x + 1 & \text{if } x > 0 \end{cases}$

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

43.  $f(x) = \begin{cases} -1 & \text{if } x < -1 \\ 1 & \text{if } -1 \leq x \leq 1 \\ -1 & \text{if } x > 1 \end{cases}$

44.  $f(x) = \begin{cases} -1 & \text{if } x < -1 \\ x & \text{if } -1 \leq x \leq 1 \\ 1 & \text{if } x > 1 \end{cases}$

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


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

47.  $f(x) = \begin{cases} 0 & \text{if } |x| \leq 2 \\ 3 & \text{if } |x| > 2 \end{cases}$

48.  $f(x) = \begin{cases} x^2 & \text{if } |x| \leq 1 \\ 1 & \text{if } |x| > 1 \end{cases}$

49.  $f(x) = \begin{cases} 4 & \text{if } x < -2 \\ x^2 & \text{if } -2 \leq x \leq 2 \\ -x + 6 & \text{if } x > 2 \end{cases}$

50.  $f(x) = \begin{cases} -x & \text{if } x \leq 0 \\ 9 - x^2 & \text{if } 0 < x \leq 3 \\ x - 3 & \text{if } x > 3 \end{cases}$

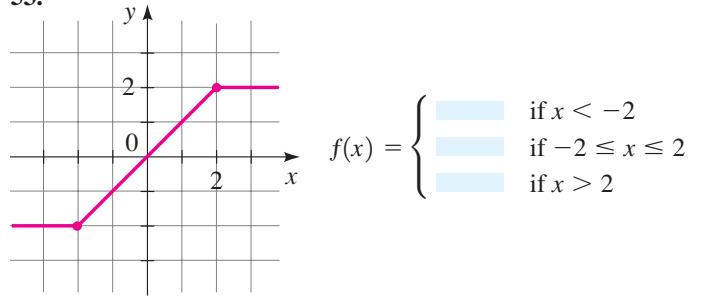
 **51–52** ■ Use a graphing device to draw the graph of the piecewise defined function. (See the margin note on page 162.)

51.  $f(x) = \begin{cases} x + 2 & \text{if } x \leq -1 \\ x^2 & \text{if } x > -1 \end{cases}$

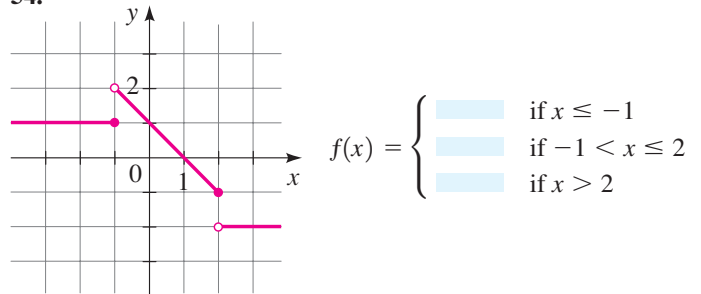
52.  $f(x) = \begin{cases} 2x - x^2 & \text{if } x > 1 \\ (x - 1)^3 & \text{if } x \leq 1 \end{cases}$

**53–54** ■ The graph of a piecewise defined function is given. Find a formula for the function in the indicated form.

53.

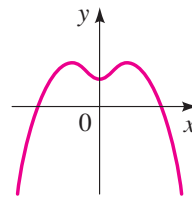


54.

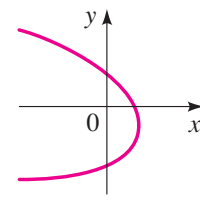


**55–56** ■ Determine whether the curve is the graph of a function of  $x$ .

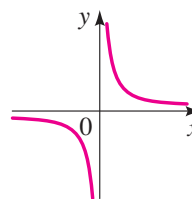
55. (a)



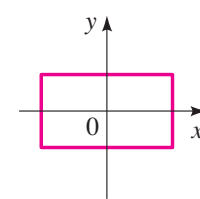
(b)



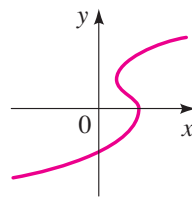
(c)



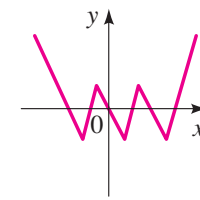
(d)



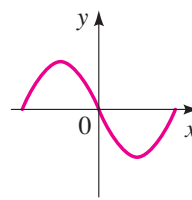
56. (a)



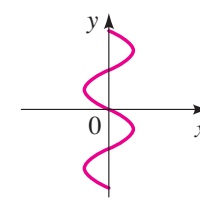
(b)



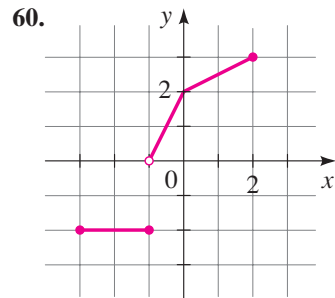
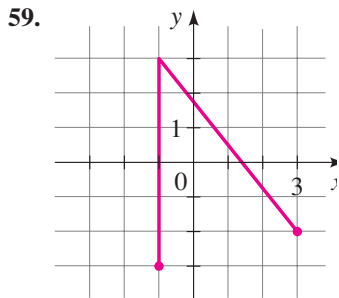
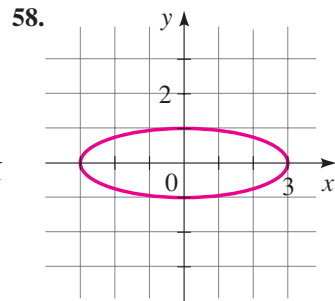
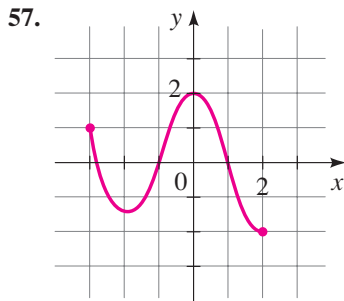
(c)



(d)



**57–60** ■ Determine whether the curve is the graph of a function  $x$ . If it is, state the domain and range of the function.



**61–72** ■ Determine whether the equation defines  $y$  as a function of  $x$ . (See Example 10.)

**61.**  $x^2 + 2y = 4$

**62.**  $3x + 7y = 21$

**63.**  $x = y^2$

**64.**  $x^2 + (y - 1)^2 = 4$

**65.**  $x + y^2 = 9$

**66.**  $x^2 + y = 9$

**67.**  $x^2y + y = 1$

**68.**  $\sqrt{x} + y = 12$

**69.**  $2|x| + y = 0$

**70.**  $2x + |y| = 0$

**71.**  $x = y^3$

**72.**  $x = y^4$



**73–78** ■ A family of functions is given. In parts (a) and (b) graph all the given members of the family in the viewing rectangle indicated. In part (c) state the conclusions you can make from your graphs.

**73.**  $f(x) = x^2 + c$

(a)  $c = 0, 2, 4, 6$ ;  $[-5, 5]$  by  $[-10, 10]$

(b)  $c = 0, -2, -4, -6$ ;  $[-5, 5]$  by  $[-10, 10]$

(c) How does the value of  $c$  affect the graph?

**74.**  $f(x) = (x - c)^2$

(a)  $c = 0, 1, 2, 3$ ;  $[-5, 5]$  by  $[-10, 10]$

(b)  $c = 0, -1, -2, -3$ ;  $[-5, 5]$  by  $[-10, 10]$

(c) How does the value of  $c$  affect the graph?

**75.**  $f(x) = (x - c)^3$

(a)  $c = 0, 2, 4, 6$ ;  $[-10, 10]$  by  $[-10, 10]$

(b)  $c = 0, -2, -4, -6$ ;  $[-10, 10]$  by  $[-10, 10]$

(c) How does the value of  $c$  affect the graph?

**76.**  $f(x) = cx^2$

(a)  $c = 1, \frac{1}{2}, 2, 4$ ;  $[-5, 5]$  by  $[-10, 10]$

(b)  $c = 1, -1, -\frac{1}{2}, -2$ ;  $[-5, 5]$  by  $[-10, 10]$

(c) How does the value of  $c$  affect the graph?

**77.**  $f(x) = x^c$

(a)  $c = \frac{1}{2}, \frac{1}{4}, \frac{1}{6}$ ;  $[-1, 4]$  by  $[-1, 3]$

(b)  $c = 1, \frac{1}{3}, \frac{1}{5}$ ;  $[-3, 3]$  by  $[-2, 2]$

(c) How does the value of  $c$  affect the graph?

**78.**  $f(x) = 1/x^n$

(a)  $n = 1, 3$ ;  $[-3, 3]$  by  $[-3, 3]$

(b)  $n = 2, 4$ ;  $[-3, 3]$  by  $[-3, 3]$

(c) How does the value of  $n$  affect the graph?

**79–82** ■ Find a function whose graph is the given curve.

**79.** The line segment joining the points  $(-2, 1)$  and  $(4, -6)$

**80.** The line segment joining the points  $(-3, -2)$  and  $(6, 3)$

**81.** The top half of the circle  $x^2 + y^2 = 9$

**82.** The bottom half of the circle  $x^2 + y^2 = 9$

## Applications

**83. Weight Function** The graph gives the weight of a certain person as a function of age. Describe in words how this person's weight has varied over time. What do you think happened when this person was 30 years old?



**84. Distance Function** The graph gives a salesman's distance from his home as a function of time on a certain day. Describe in words what the graph indicates about his travels on this day.

