5.1 EXERCISES

PRACTICE

For each function or graph below, determine the basic function that has been shifted, reflected, stretched, or compressed.

1. $f(x) = -(1-x)^2 + 2$

2. $f(x) = \dfrac{1}{x-4} + 5$

3. $f(x) = \sqrt[3]{x+6} - 2$

4. $f(x) = -2 + 2|x-3|$

5. $f(x) = \sqrt{x+2} - 5$

6. $f(x) = [\![-2-x]\!]$

7. $f(x) = \dfrac{1}{(x+2)^2} + 1$

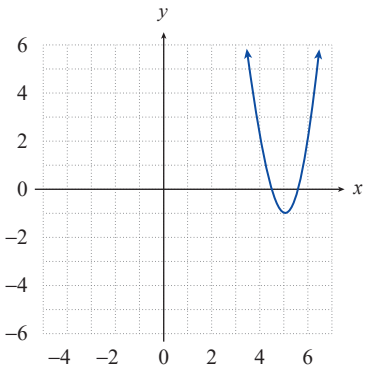
8. $f(x) = \dfrac{\sqrt{-x}}{2} + 4$

9. $f(x) = (x+6)^3$

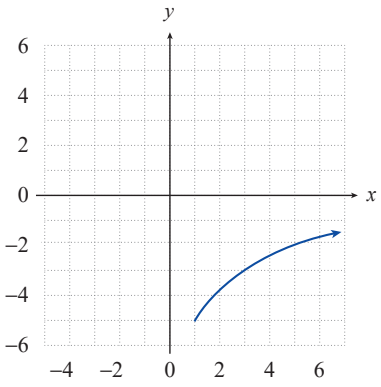
10. $f(x) = (1-2x)^3$

11. $f(x) = 3\left|\dfrac{x}{2} - 1\right|$

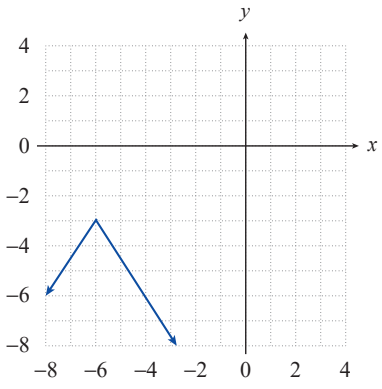
12.



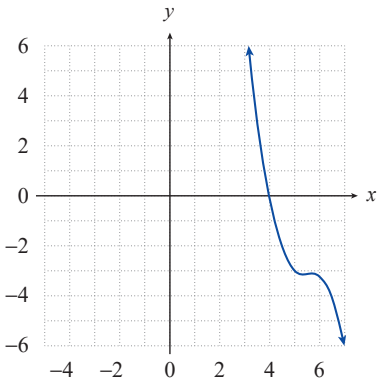
13.



14.



15.



Sketch the graphs of the following functions by first identifying the more basic functions that have been shifted, reflected, stretched, or compressed. Then determine the domain and range of each function. See Examples 1 through 6.

16. $f(x)=(x+2)^3$

17. $G(x)=|x-4|$

18. $p(x)=-(x+1)^2+2$

19. $g(x)=\sqrt{x+3}-1$

20. $q(x)=(1-x)^2$

21. $r(x)=-\sqrt[3]{x}$

22. $s(x)=\sqrt{2-x}$

23. $F(x)=\dfrac{|x+2|}{3}+3$

24. $w(x)=\dfrac{1}{(x-3)^2}$

25. $v(x)=\dfrac{1}{3x}-2$

26. $f(x)=\dfrac{1}{2-x}$

27. $k(x)=\sqrt{-x}+2$

28. $b(x)=\sqrt[3]{x+2}-5$

29. $b(x)=[\![x-4]\!]+4$

30. $R(x)=4-2|x|$

31. $S(x)=(3-x)^3$

32. $g(x)=-\dfrac{1}{x+1}$

33. $h(x)=\dfrac{x^2}{2}-3$

34. $W(x)=1-|4-x|$

35. $W(x)=-\dfrac{|x-1|}{4}$

36. $S(x)=\dfrac{1}{x^2}+3$

37. $V(x)=-3\sqrt{x-1}+2$

38. $f(x)=\sqrt{2x-2}-2$

39. $g(x)=(2x-3)^2+1$

40. $f(x)=|1-2x|-1$

41. $g(x)=-(3x+3)^3$

42. $g(x)=x^2-6x+9$ (**Hint:** Find a better way to write the function.)

43. $h(x)=\dfrac{|x|}{x}$ (**Hint:** Evaluate h at a few points to understand its behavior.)

44. $W(x)=\dfrac{x-1}{|x-1|}$

45. $s(x)=[\![x-2]\!]$

Write a formula for each of the functions described.

46. Use the function $g(x)=x^2$. Move the function 3 units to the left and 4 units down.

47. Use the function $g(x)=x^2$. Move the function 4 units to the right and 2 units up.

48. Use the function $g(x)=x^2$. Reflect the function across the x-axis and move it 6 units up.

49. Use the function $g(x)=x^2$. Move the function 2 units to the right and reflect across the y-axis.

50. Use the function $g(x) = x^3$. Compress the function horizontally by a factor of $\frac{1}{3}$ and move it 1 unit down.

51. Use the function $g(x) = x^3$. Move the function 1 unit to the left and reflect across the y-axis.

52. Use the function $g(x) = x^3$. Move the function 10 units to the right and 4 units up.

53. Use the function $g(x) = \sqrt{x}$. Move the function 5 units to the left and reflect across the x-axis.

54. Use the function $g(x) = \sqrt{x}$. Reflect the function across the y-axis and move it 3 units down.

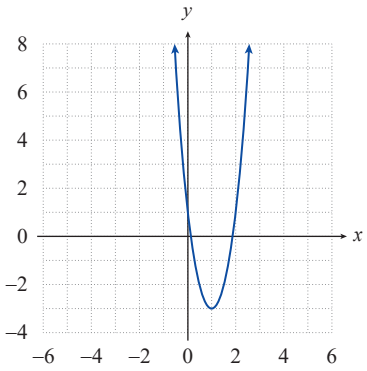
55. Use the function $g(x) = \sqrt{x}$. Stretch the function horizontally by a factor of 2, reflect it with respect to the y-axis, and move it 3 units up.

56. Use the function $g(x) = |x|$. Move the function 7 units to the left, reflect across the x-axis, and reflect across the y-axis.

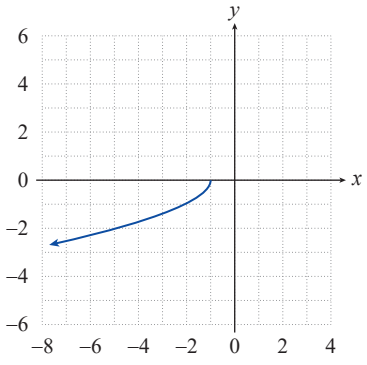
57. Use the function $g(x) = |x|$. Move the function 8 units to the right, 2 units up, and reflect across the x-axis.

Use your knowledge about transformations to find a possible formula for the function $f(x)$ given its graph.

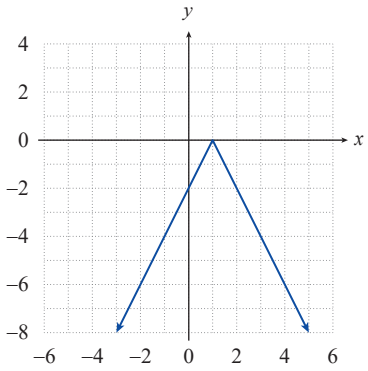
58.



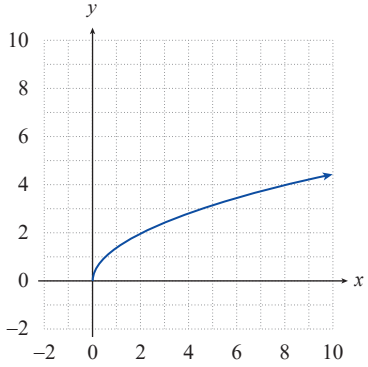
59.



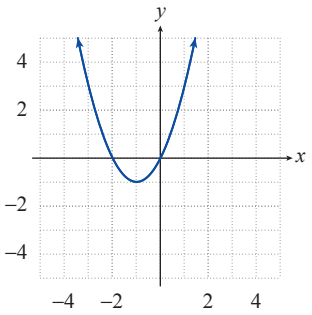
60.



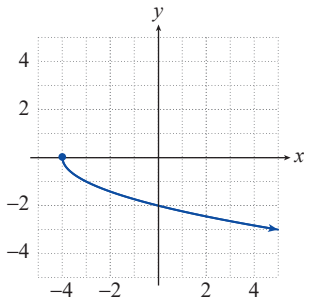
61.



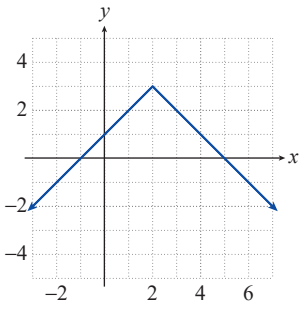
62.



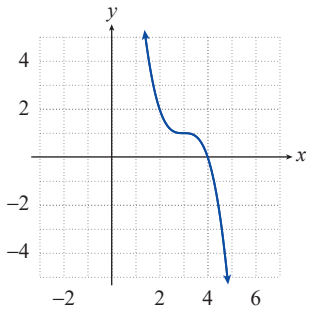
63.



64.



65.



TECHNOLOGY

Mentally sketch the graph of the given function by identifying the basic shape that has been shifted, reflected, stretched, or compressed. Then use a graphing utility to graph the function and check your reasoning

66. $f(x) = -2(3-x)^3 + 5$

67. $f(x) = \dfrac{3}{x+5} - 1$

68. $f(x) = \dfrac{-1}{(x-2)^2} - 3$

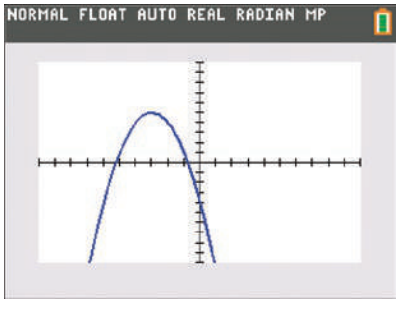
69. $f(x) = -3|x+2| - 4$

70. $f(x) = -\sqrt{1-x} + 2$

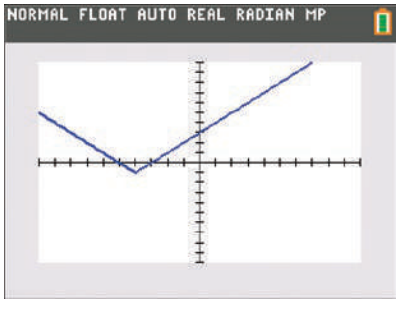
71. $f(x) = \sqrt[3]{2+x} - 1$

Write a possible equation for the function depicted on the graphing utility. The function is shown in a $[-10,10]$ by $[-10,10]$ viewing window.

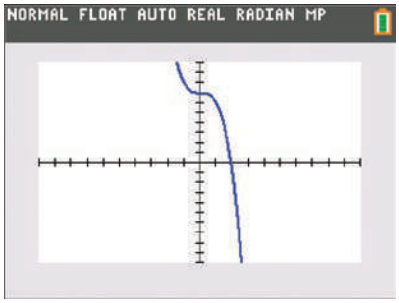
72.



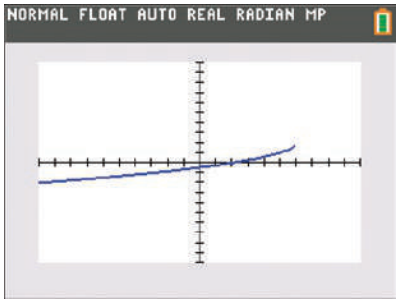
73.



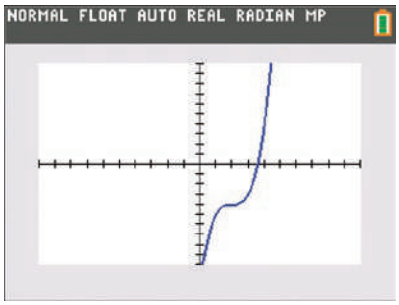
74.



75.



76.



77.