

2.1 Exercises

1–4 ■ Express the rule in function notation. (For example, the rule “square, then subtract 5” is expressed as the function $f(x) = x^2 - 5$.)

1. Add 3, then multiply by 2
2. Divide by 7, then subtract 4
3. Subtract 5, then square
4. Take the square root, add 8, then multiply by $\frac{1}{3}$

5–8 ■ Express the function (or rule) in words.

5. $f(x) = \frac{x-4}{3}$
6. $g(x) = \frac{x}{3} - 4$
7. $h(x) = x^2 + 2$
8. $k(x) = \sqrt{x+2}$

9–10 ■ Draw a machine diagram for the function.

9. $f(x) = \sqrt{x-1}$
10. $f(x) = \frac{3}{x-2}$

11–12 ■ Complete the table.

11. $f(x) = 2(x-1)^2$
12. $g(x) = |2x+3|$

x	$f(x)$
-1	
0	
1	
2	
3	

x	$g(x)$
-3	
-2	
0	
1	
3	

13–20 ■ Evaluate the function at the indicated values.

13. $f(x) = 2x + 1$;
 $f(1), f(-2), f(\frac{1}{2}), f(a), f(-a), f(a+b)$

14. $f(x) = x^2 + 2x$;
 $f(0), f(3), f(-3), f(a), f(-x), f(\frac{1}{a})$

15. $g(x) = \frac{1-x}{1+x}$;
 $g(2), g(-2), g(\frac{1}{2}), g(a), g(a-1), g(-1)$

16. $h(t) = t + \frac{1}{t}$;
 $h(1), h(-1), h(2), h(\frac{1}{2}), h(x), h(\frac{1}{x})$

17. $f(x) = 2x^2 + 3x - 4$;
 $f(0), f(2), f(-2), f(\sqrt{2}), f(x+1), f(-x)$

18. $f(x) = x^3 - 4x^2$;
 $f(0), f(1), f(-1), f(\frac{3}{2}), f(\frac{x}{2}), f(x^2)$

19. $f(x) = 2|x-1|$;
 $f(-2), f(0), f(\frac{1}{2}), f(2), f(x+1), f(x^2+2)$

20. $f(x) = \frac{|x|}{x}$;
 $f(-2), f(-1), f(0), f(5), f(x^2), f(\frac{1}{x})$

21–24 ■ Evaluate the piecewise defined function at the indicated values.

21. $f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ x+1 & \text{if } x \geq 0 \end{cases}$
 $f(-2), f(-1), f(0), f(1), f(2)$

22. $f(x) = \begin{cases} 5 & \text{if } x \leq 2 \\ 2x-3 & \text{if } x > 2 \end{cases}$
 $f(-3), f(0), f(2), f(3), f(5)$

23. $f(x) = \begin{cases} x^2 + 2x & \text{if } x \leq -1 \\ x & \text{if } -1 < x \leq 1 \\ -1 & \text{if } x > 1 \end{cases}$
 $f(-4), f(-\frac{3}{2}), f(-1), f(0), f(25)$

24. $f(x) = \begin{cases} 3x & \text{if } x < 0 \\ x+1 & \text{if } 0 \leq x \leq 2 \\ (x-2)^2 & \text{if } x > 2 \end{cases}$
 $f(-5), f(0), f(1), f(2), f(5)$

25–28 ■ Use the function to evaluate the indicated expressions and simplify.

25. $f(x) = x^2 + 1$; $f(x+2), f(x) + f(2)$

26. $f(x) = 3x - 1$; $f(2x), 2f(x)$

27. $f(x) = x + 4$; $f(x^2), (f(x))^2$

28. $f(x) = 6x - 18$; $f(\frac{x}{3}), \frac{f(x)}{3}$

29–36 ■ Find $f(a)$, $f(a+h)$, and the difference quotient $\frac{f(a+h) - f(a)}{h}$, where $h \neq 0$.

29. $f(x) = 3x + 2$

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