

4.1 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. Multiply by 3, then add 1
2. Subtract 5, then divide by 7
3. Add 2, then square
4. Square, add 1, then take the square root

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

5. $f(x) = \frac{x}{3} - 5$
6. $g(x) = \frac{x - 5}{3}$
7. $h(x) = 2x^2 - 3$
8. $k(x) = \sqrt{2x + 1}$

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

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

11-12 ■ Complete the table.

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

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

12. $g(x) = |2x - 3|$

x	$g(x)$
-2	
0	
1	
3	
5	

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

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

29-34 ■ Find $f(a), f(a + h)$, and $\frac{f(a + h) - f(a)}{h}$,

where $h \neq 0$.

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

ed in all four ways, and it is often useful to gain insight into the function. However, naturally by one method than by the other. An

ulation of the world at time t "

numerically by giving a table of values (see entation of the area of a circle as a function of

$A(r) = \pi r^2$

h (see the box) is a visual representation of the the ground during an earthquake. As a final), which is described verbally as "the cost of ht w ." The most convenient way of describing , using a table of values.

entations of functions throughout this book. We ox.

Algebraic

Formula:

$$A(r) = \pi r^2$$

Numerical

Table of values:

r	$C(w)$ (dollars)
0.33	
0.55	
0.77	
0.99	
1.21	
...	