1-1 Functions

Write each set of numbers in set-builder and interval notation, if possible.

3. $x \leq -4$

ANSWER:

$\{x \mid x \leq -4, x \in \mathbb{R}\}$; $(-\infty, -4]$

6. $-31 < x \leq 64$

ANSWER:

$\{ x \mid -31 < x \leq 64, x \in \mathbb{R}\}$; $(-31, 64]$

9. $\{-0.25, 0, 0.25, 0.50, \ldots\}$

ANSWER:

$\{ x \mid 0.25n = x, n \geq -1, n \in \mathbb{Z}\}$

12. all multiples of 8

ANSWER:

$\{x \mid x = 8n, n \in \mathbb{Z}\}$

Determine whether each relation represents y as a function of x.

15. The input value x is a bank account number and the output value y is the account balance.

ANSWER:

function

1-1 Functions

18.

x	y
0.01	423
0.04	449
0.04	451
0.07	466
0.08	478
0.09	482

ANSWER:

not a function

21. $3y + 4x = 11$

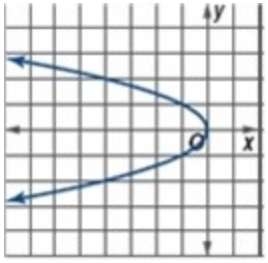
ANSWER:

function

24. $\frac{x}{y} = y - 6$

ANSWER:

not a function

27. 

ANSWER:

not a function

1-1 Functions

Find each function value.

30. $g(x) = 2x^2 + 18x - 14$

a. $g(9)$

b. $g(3x)$

c. $g(1 + 5m)$

ANSWER:

a. 310

b. $18x^2 + 54x - 14$

c. $50m^2 + 110m + 6$

33. $g(x) = \dfrac{3x^3}{x^2 + x - 4}$

a. $g(-2)$

b. $g(5x)$

c. $g(8 - 4b)$

ANSWER:

a. 12

b. $\dfrac{375x^3}{25x^2 + 5x - 4}$

c. $\dfrac{-48b^3 + 288b^2 - 576b + 384}{4b^2 - 17b + 17}$

36. $g(m) = 3 + \sqrt{m^2 - 4}$

a. $g(-2)$
b. $g(3m)$
c. $g(4m - 2)$

ANSWER:

a. 3
b. $3 + \sqrt{9m^2 - 4}$
c. $3 + 4\sqrt{m^2 - m}$

State the domain of each function.

39. $f(x) = \dfrac{8x + 12}{x^2 + 5x + 4}$

ANSWER:

$(-\infty, -4) \cup (-4, -1) \cup (-1, \infty)$

42. $h(x) = \sqrt{6 - x^2}$

ANSWER:

$[-\sqrt{6}, \sqrt{6}]$

Find $f(-5)$ and $f(12)$ for each piecewise function.

48. $f(x) = \begin{cases} -4x + 3 & \text{if } x < 3 \\ -x^3 & \text{if } 3 \le x \le 8 \\ 3x^2 + 1 & \text{if } x > 8 \end{cases}$

ANSWER:

23; 433

51. $f(x) = \begin{cases} -15 & \text{if } x < -5 \\ \sqrt{x+6} & \text{if } -5 \le x \le 10 \\ \frac{2}{x} + 8 & \text{if } x > 10 \end{cases}$

ANSWER:

$1; 8\frac{1}{6}$

52. **INCOME TAX** Federal income tax for a person filing single in the United States in a recent year can be modeled using the following function, where x represents income and $T(x)$ represents total tax.

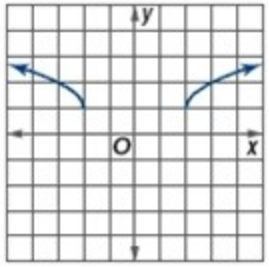
$$T(x) = \begin{cases} 0.10x & \text{if } 0 \le x \le 7285 \\ 782.5 + 0.15x & \text{if } 7285 < x \le 31{,}850 \\ 4386.25 + 0.25x & \text{if } 31{,}850 < x \le 77{,}100 \end{cases}$$

a. Find $T(7000)$, $T(10{,}000)$, and $T(50{,}000)$.
b. If a person's annual income were \$7285, what would his or her income tax be?

ANSWER:

a. \$700, \$2282.5, \$16,886.25
b. \$728.50

Use the vertical line test to determine whether each graph represents a function. Write *yes* or *no*. Explain your reasoning.

54. 

ANSWER:

Yes; a vertical line would not pass through the graph more than once.