

Functions (Pages 256–261)

A **function** is a relation in which each element of the domain is paired with *exactly* one element of the range. Equations that are functions can be written in a form called **functional notation**, $f(x)$ (read “ f of x ”). In a function, x is an element of the domain and $f(x)$ is the corresponding element in the range. In $f(3)$, $f(3)$ is the **functional value** of f for $x = 3$.

Vertical Line Test

If each vertical line passes through no more than one point of the graph of a relation, then the relation is a function.

EXAMPLES

- A** Is $\{(1, 2), (1, 3)\}$ a function? Is $\{(1, 4), (3, 2), (5, 4)\}$ a function?

1st relation: not a function

This relation has 1 paired with both 2 and 3.

2nd relation: a function

In this relation, each x -value is paired with no more than one y -value. A function can have a y -value paired with more than one x -value.

- B** If $f(x) = 3x - 1$ and $g(x) = 2x$, find $f(1)$ and $g(3)$.

$$f(x) = 3x - 1$$

$$f(1) = 3(1) - 1 \text{ or } 2 \quad \text{Replace } x \text{ with } 1.$$

$$g(x) = 2x$$

$$g(3) = 2(3) \text{ or } 6 \quad \text{Replace } x \text{ with } 3.$$

PRACTICE

Determine whether each relation is a function.

1.

x	y
-1	10
-2	13
-3	16

2.

x	y
2	0
2	-1
3	-4

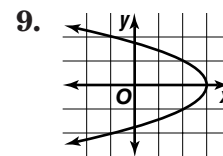
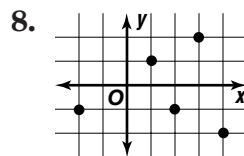
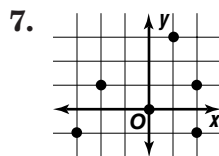
3.

x	y
33	10
35	8
36	10

4. $\{(7, 4), (6, 3), (5, 2)\}$

5. $\{(15, 0), (15, -2)\}$

6. $\{(0, 1), (2, 1), (0, 3)\}$



If $f(x) = -3x$ and $g(x) = x - 5$, find each value.

10. $f(7)$

11. $g(7)$

12. $g(-8)$

13. $f(-1)$

14. $f(a)$

15. $g(m)$

16. $g(9)$

17. $f(2)$



- 18. Standardized Test Practice** Martha pays a flat \$50 a month for the use of her cell phone. She also pays \$0.30 for each minute that she talks over 6 hours. The cost of her phone bill can be represented by $f(x) = 50 + 0.30x$, where x is the number of minutes past 6 hours that she uses the phone. Evaluate $f(60)$ to find the amount of her phone bill if she uses the phone for 7 hours.

A \$68.30

B \$68.00

C \$50.30

D \$18.00

Answers: 1. yes 2. no 3. yes 4. yes 5. no 6. no 7. no 8. yes 9. no 10. -21 11. 2 12. -13 13. 3 14. -3a 15. $m - 5$ 16. 4 17. -6 18. B