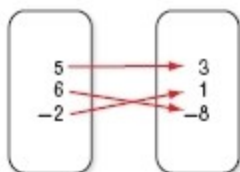


2-1 Relations and Functions

CCSS STRUCTURE State the domain and range of each relation. Then determine whether each relation is a *function*. If it is a function, determine if it is *one-to-one*, *onto*, *both*, or *neither*.



1.

ANSWER:

$D = \{-2, 5, 6\}$, $R = \{-8, 1, 3\}$; function; both

x	y
-2	-4
1	-4
4	-2
8	6

3.

ANSWER:

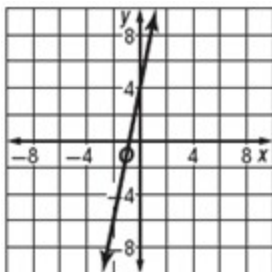
$D = \{-2, 1, 4, 8\}$, $R = \{-4, -2, 6\}$; function; onto

Graph each equation, and determine the domain and range. Determine whether the equation is a *function*, is *one-to-one*, *onto*, *both*, or *neither*.

Then state whether it is *discrete* or *continuous*.

5. $y = 5x + 4$

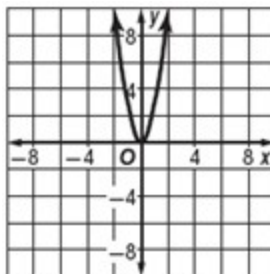
ANSWER:



$D = \{\text{all real numbers}\}$;
 $R = \{\text{all real numbers}\}$;
 function; both; continuous

7. $y = 3x^2$

ANSWER:



$D = \{\text{all real numbers}\}$;

$R = \{y \mid y \geq 0\}$;

function; neither; continuous

Evaluate each function.

9. $f(-3)$ if $f(x) = -4x - 8$

ANSWER:

4

State the domain and range of each relation.

Then determine whether each relation is a *function*. If it is a function, determine if it is *one-to-one*, *onto*, *both*, or *neither*.

x	y
-0.3	-6
0.4	-3
1.2	-1
1.2	4

11.

ANSWER:

$D = \{-0.3, 0.4, 1.2\}$, $R = \{-6, -3, -1, 4\}$; not a function

13. $\{(-3, -4), (-1, 0), (3, 0), (5, 3)\}$

ANSWER:

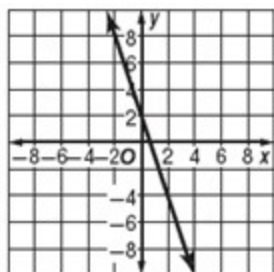
$D = \{-3, -1, 3, 5\}$; $R = \{-4, 0, 3\}$; function; onto

2-1 Relations and Functions

CCSS STRUCTURE Graph each equation, and determine the domain and range. Determine whether the equation is a *function*, is *one-to-one*, *onto*, *both*, or *neither*. Then state whether it is *discrete* or *continuous*.

15. $y = -3x + 2$

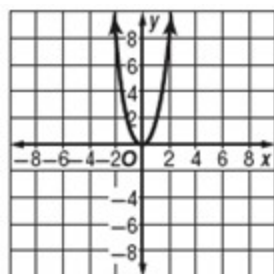
ANSWER:



$D = \{\text{all real numbers}\};$
 $R = \{\text{all real numbers}\};$
 function; both; continuous

17. $y = 2x^2$

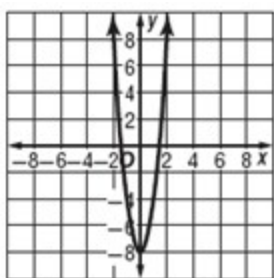
ANSWER:



$D = \{\text{all real numbers}\};$
 $R = \{y \mid y \geq 0\};$
 function; neither; continuous

19. $y = 4x^2 - 8$

ANSWER:



$D = \{\text{all real numbers}\};$
 $R = \{y \mid y \geq -8\};$
 function; neither; continuous

Evaluate each function.

21. $f(-8)$ if $f(x) = 5x^3 + 1$

ANSWER:

-2559

23. **DIVING** The table below shows the pressure on a diver at various depths.

Depth (ft)	0	20	40	60	80	100
Pressure (atm)	1	1.6	2.2	2.8	3.4	4

- Write a relation to represent the data.
- Graph the relation.
- Identify the domain and range. Is the relation *discrete* or *continuous*?
- Is the relation a function? Explain your reasoning.

ANSWER:

- $\{(0,1), (20,1.6), (40,2.2), (60,2.8), (80,3.4), (100,4)\}$
-



- $D = \{x \mid x \geq 0\}; R = \{y \mid y \geq 1\};$ continuous
- yes; each domain value is paired with only one range value so the relation is a function.

Find each value if

$f(x) = 3x + 2$, $g(x) = -2x^2$, and

$h(x) = -4x^2 - 2x + 5$.

25. $f(9)$

ANSWER:

29

2-1 Relations and Functions

27. $g(-6)$

ANSWER:

-72

29. $h(8)$

ANSWER:

-267

31. $g\left(\frac{3}{2}\right)$

ANSWER:

-4.5

33. **PODCASTS** Chaz has a collection of 15 podcasts downloaded on his digital audio player. He decides to download 3 more podcasts each month. The function $P(t) = 15 + 3t$ counts the number of podcasts $P(t)$ he has after t months. How many podcasts will he have after 8 months?

ANSWER:

39

35. **CCSS CRITIQUE** Omar and Madison are finding $f(3d)$ for the function $f(x) = -4x^2 - 2x + 1$. Is either of them correct? Explain your reasoning.

Omar	Madison
$f(3d) = -4(3d)^2 - 2(3d) + 1$	$f(3d) = -4(3d)^2 - 2(3d) + 1$
$= -4(9d^2) - 6d + 1$	$= 12d^2 - 6d + 1$
$= -36d^2 - 6d + 1$	

ANSWER:

Sample answer: Omar; Madison did not square the 3 before multiplying by -4 .

37. **REASONING** If the graph of a relation crosses the y -axis at more than one point, is the relation *sometimes*, *always*, or *never* a function? Explain your reasoning.

ANSWER:

Never; if the graph crosses the y -axis twice, then there will be two separate y -values that correspond to $x = 0$, which violates the vertical line test.

39. **REASONING** Determine whether the following statement is *true* or *false*. Explain your reasoning. *If a function is onto, then it must be one-to-one as well.*

ANSWER:

Sample answer: False; a function is onto and not one-to-one if all of the elements of the domain correspond to an element of the range, but more than one element of the domain corresponds to the same element of the range.

41. Patricia's swimming pool contains 19,500 gallons of water. She drains the pool at a rate of 6 gallons per minute. Which of these equations represents the number of gallons of water g , remaining in the pool after m minutes?

A $g = 19,500 - 6m$

B $g = 19,500 + 6m$

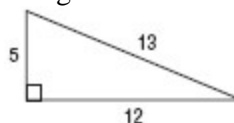
C $g = \frac{19,500}{6m}$

D $g = \frac{6m}{19,500}$

ANSWER:

A

43. **GEOMETRY** Which set of dimensions represents a triangle similar to the triangle shown below?



F 1 unit, 2 units, 3 units

G 7 units, 11 units, 12 units

H 10 units, 23 units, 24 units

J 20 units, 48 units, 52 units

ANSWER:

J

2-1 Relations and Functions

Solve each inequality.

45. $48 > 7y + 6 > 20$

ANSWER:

$$6 > y > 2$$

47. $2|4x + 2| + 3 > 21$

ANSWER:

$$x > \frac{7}{4} \text{ or } x < -\frac{11}{4}$$

49. **SALES** Ling can spend no more than \$120 at the summer sale of a department store. She wants to buy shirts on sale for \$15 each. Write and solve an inequality to determine the number of shirts she can buy.

ANSWER:

$$15x \leq 120; \text{ She can buy up to 8 shirts.}$$

Solve each equation. Check your solutions.

51. $2 = -3|4c - 5| + 8$

ANSWER:

$$\frac{3}{4} \text{ or } \frac{7}{4}$$

Simplify each expression.

53. $6(3a - 2b) + 3(5a + 4b)$

ANSWER:

$$33a$$

55. $-7(2c - 4d) + 8(3c + d)$

ANSWER:

$$10c + 36d$$

Solve each equation. Check your solutions.

57. $6a - 3 = 21$

ANSWER:

$$4$$

59. $6b + 4 = -2b - 28$

ANSWER:

$$-4$$

61. $4(2y - 3) + 5(3y + 1) = -99$

ANSWER:

$$-4$$

63. $8d - 4 + 3d = 2d - 100 - 7d$

ANSWER:

$$-6$$