

4-5

Formalizing Relations

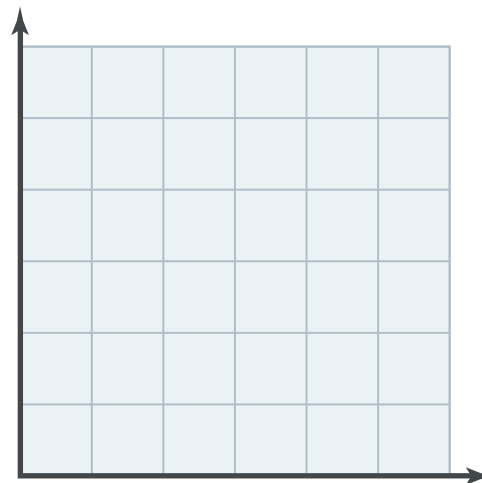
OBJECTIVE: I can determine whether a relation is a function to find domain and range and use function notation



Warm-Up

In a scoring system of some track meets, first place is worth 5 points, second place is worth 3 points, third place is worth 2 points, and fourth place is worth 1 point. This scoring system is a relation, so it can be shown as ordered pairs, $\{(1,5), (2,3), (3,2), (4,1)\}$. Please fill the table and graph the ordered pairs.

| X | Y |
|---|---|
| | |
| | |
| | |
| | |



Essential Understanding

Essential Understanding A function is a special type of relation in which each value in the domain is paired with exactly one value in the range.

A relation is a pairing of numbers in one set, called the domain, with numbers in another set, called the range. A relation is often represented as a set of ordered pairs (x, y) . In this case, the domain is the set of x -values and the range is the set of y -values.



Example

#1 Identifying Functions Using Mapping Diagrams



Identify the domain and range of each relation. Represent the relation with a mapping diagram. Is the relation a function?

A $\{(-2, 0.5), (0, 2.5), (4, 6.5), (5, 2.5)\}$

The domain is

The range is

B $\{(6, 5), (4, 3), (6, 4), (5, 8)\}$

The domain is

The range is

Your Turn to Work it Out



1. Identify the domain and range of each relation. Represent the relation with a mapping diagram. Is the relation a function?

a. $\{(4.2, 1.5), (5, 2.2), (7, 4.8), (4.2, 0)\}$

b. $\{(-1, 1), (-2, 2), (4, -4), (7, -7)\}$

Example

#2 Identifying Functions Using the Vertical Line Test

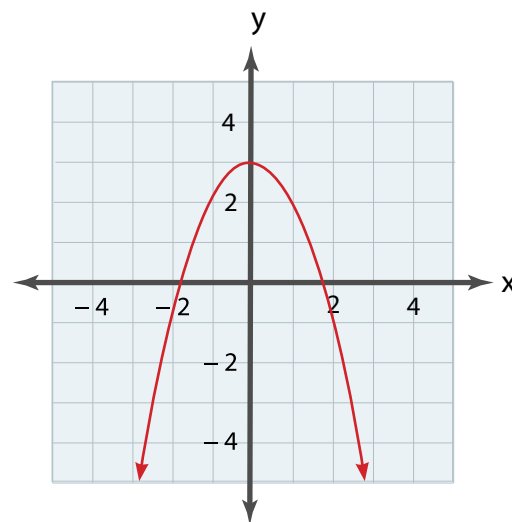
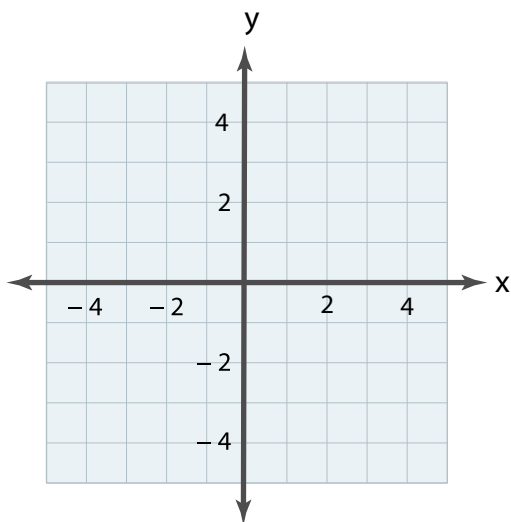


Another way to decide if a relation is a function is to analyze the graph of the relation using the **vertical line** test. If any vertical line passes through more than one point of the graph, then for some domain value there is more than one range value. So the relation is not a function.

Is the relation a function? Use the vertical line test.

A $\{(-4, 2), (-3, 1), (0, -2), (-4, -1), (1, 2)\}$

B $y = -x^2 + 3$

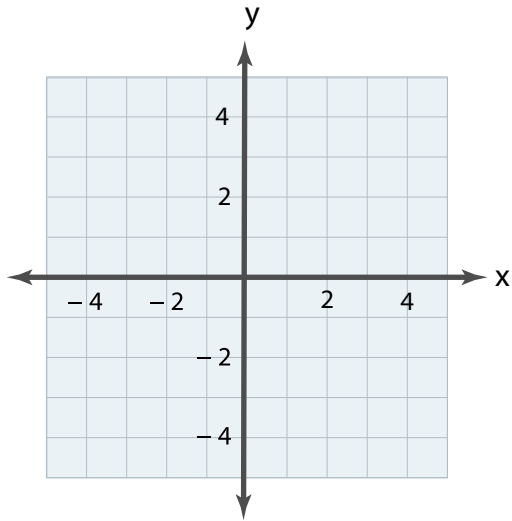


Your Turn to Work it Out

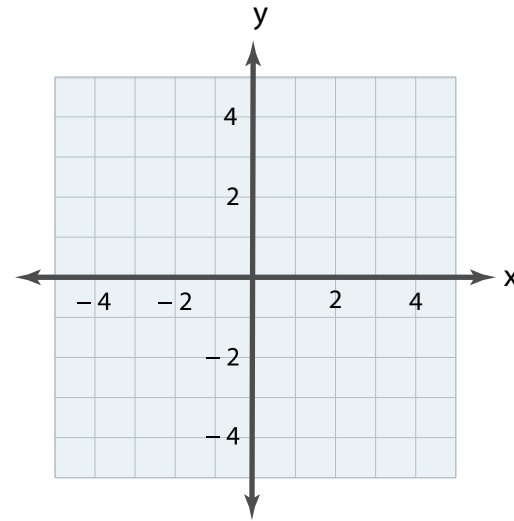


2. Is the relation a function? Use the vertical line test.

a. $\{(4, 2), (1, 2), (0, 1), (-2, 2), (3, 3)\}$



b. $\{(0, 2), (1, -1), (-1, 4), (0, -3), (2, 1)\}$



Example

#3 Evaluating a Function



You have seen functions represented as equations involving x and y , such as $y = -3x + 1$. Below is the same equation written using **function notation**.

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

Notice that $f(x)$ replaces y . It is read “**f of x**.” The letter f is the name of the function, not a variable. Function notation is used to emphasize that the function value $f(x)$ depends on the independent variable x . Other letters besides f can also be used, such as g and h .

Reading The function $w(x) = 250x$ represents the number of words $w(x)$ you can read in x -minutes. How many words can you read in 8 min?

Your Turn to Work it Out



3. Use the function in Problem 3. How many words can you read in 6 min?

Example

#4 Finding the Range of a Function



Multiple Choice The domain of $f(x) = -1.5x + 4$ is $\{1, 2, 3, 4\}$. What is the range?

- (A) $\{-2, -0.5, 1, 2.5\}$ (B) $\{5-2.5, -1, 0.5, 2\}$
(C) $\{-2.5, -1, -0.5, 2\}$ (D) $\{-2.5, -0.5, 1, 2\}$

| x | $f(x) = -1.5x + 4$ | f(x) |
|---|--------------------|------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |

Your Turn to Work it Out



4. The domain of $g(x) = 4x - 12$ is $\{1, 3, 5, 7\}$. What is the range?

| x | | $g(x)$ |
|---|--|--------|
| | | |
| | | |
| | | |
| | | |