

Functions

In the unit on Venn diagrams we learned that a **set of ordered pairs**, such as $\{(2, 4), (3, 8), (5, 7), (-2, 1)\}$, is called a **relation**. Each **element** in a *relation* has a **value**—an x -value and a y -value (x, y) . The **ordered pairs** are called **coordinates** (x, y) of a point on a graph.

The *set* containing all of the x -values is called the **domain**, while the set of all y -values is called the **range**.

From the example $\{(2, 4), (3, 8), (5, 7), (-2, 1)\}$ the *domain* would be $\{2, 3, 5, -2\}$ and the *range* would be $\{4, 8, 7, 1\}$.

A *relation* in which no x -value is repeated is called a **function**. Another way to say that is each element of the domain is paired with only one element of the range.

Set of Ordered Pairs—Relation

$\{(2, 4), (3, 8), (5, 7), (-2, 1)\}$

x -values, or first numbers of the ordered pairs—domain = $\{2, 3, 5, -2\}$



$(2, 4)$

$(3, 8)$

$(5, 7)$

$(-2, 1)$



y -values, or second numbers of the ordered pairs—range = $\{4, 8, 7, 1\}$

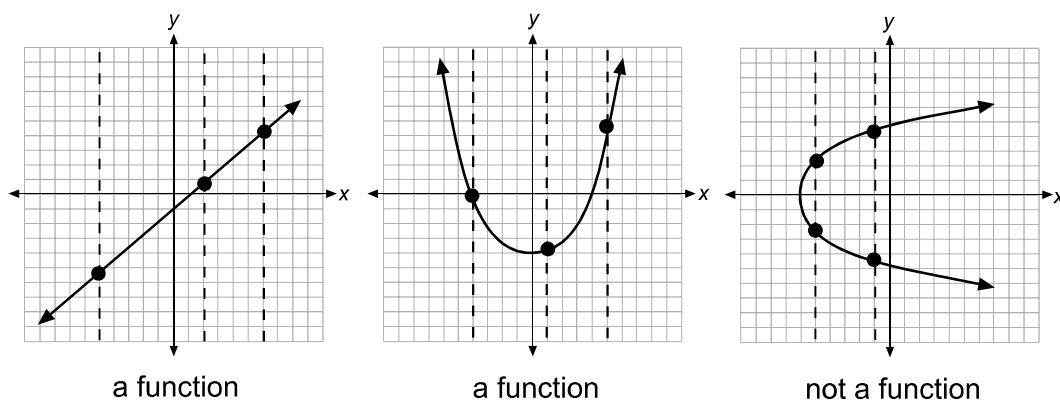
This relation is a function because of the following.

- no x -value is repeated
- each element of the domain, or x -values, can be paired with only one element of the range, or y -values

Note: Usually *values* are listed in numerical order. However, for giving the domain (x -values) and the range (y -values) for relations, numerical order is *not* required. If a value in a domain or in a range is repeated, list the value *one* time.

Graphs of Functions

Using the **vertical line test**, it is possible to tell from a graph whether a relation is a *function* or not. If any **vertical line** (line that is straight up and down) can be drawn that touches the graph at *no more than one point* of the graph, then the relation is a function. However, if the *vertical line* touches the graph at *more than one point*, the relation is *not* a function.



Tip: A vertical test line can use any straight-edged object, such as a pencil or pen, to perform the test. Place your pencil next to the graph. Line the pencil up vertically with the graph and move it slowly across the graph.

