Intro to Functions

Summary

1. A function has only one output value for each input value.
2. Function notation can be used to describe and quickly evaluate a function.

Relations and Functions

Relations

A **relation** is a set of ordered pairs.

Domain

The **domain** is the set of all input values (usually x) of a relation.

Range

The **range** is the set of all output values (usually y) of a relation.

Function

A **function** is a relation is which each element of the domain has only 1 element in the range.

Example 1. Determine whether each relation represents a function.
For those that do, state the domain and range.

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

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

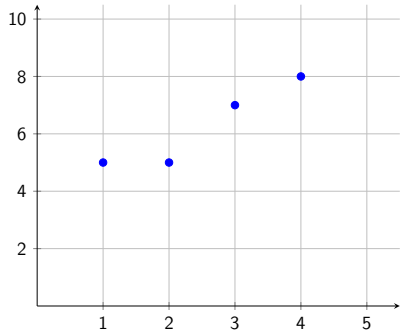
The Vertical Line Test

It is also possible to determine if a relation is a function visually by using the **vertical line test**:

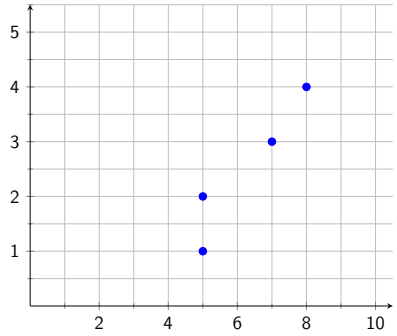
Vertical Line Test

If every vertical line drawn hits the graph **at most once**, then the relation is a function.

Example 1?? Passes V.L.T.

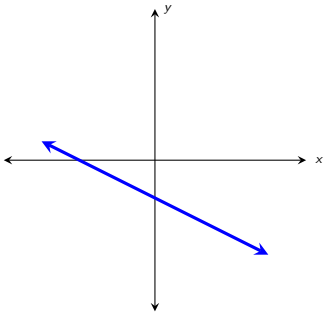


Example 1?? Fails V.L.T.

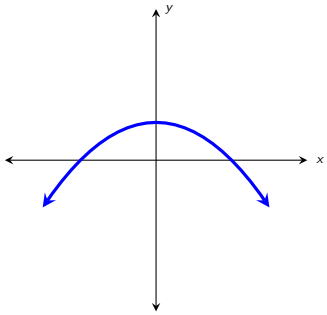


Example 2. Determine whether the graph of each represents a function.

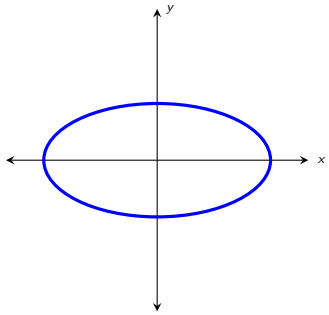
(a)



(b)



(c)

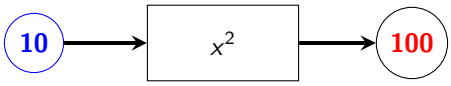


Function Notation.

Think of a function as a **machine**.

You give the function (machine) a value (input),
it will process that value, and then return a value back to you (output).

For instance, if you input 10 into the x^2 function, it will return 10^2, or 100:



A function can be described using **function notation**.

$f(x)$ represents the value of the function when the value of x is substituted into it.

We can use other notations for functions including, but not limited to,

$$g(x) \quad h(x) \quad f(n) \quad f(\text{☺})$$

When we substitute a value for the variable and evaluate it, that is called **evaluating the function**.

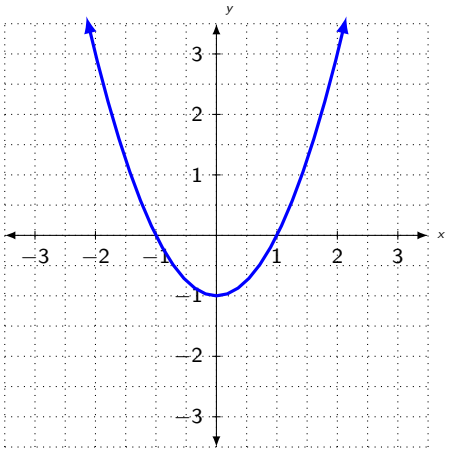
For the $f(x) = x^2$ function, the point (10, 100) is on the graph of that function.

Example 3. Evaluate $f(2)$, $f(-2)$, and $f(0)$ for each.

(a) $f(x) = 2x + 3$

(b) $f(x) = 3x^2 - 1$

(c)



(d)

x	-3	-2	-1	0	1	2	3
$f(x)$	-6	3	4	-3	-8	6	-5

Building Functions

We can build functions according to specifications listed.

Example 4. Build a function, $f(x)$, that will perform each of the following sequences of instructions.

(a) 1. Add 5 to the input

2. Take half of that result

(b) 1. Take half of the input

2. Add 5 to that result

(c) 1. Take the opposite of the input

2. Subtract 9 from that result

3. Multiply that result by -2