

Introduction to Functions

A function is a relation between inputs and outputs where each input has only ONE output.

You will typically see a function in 3 forms:
An equation, a table, and a graph.

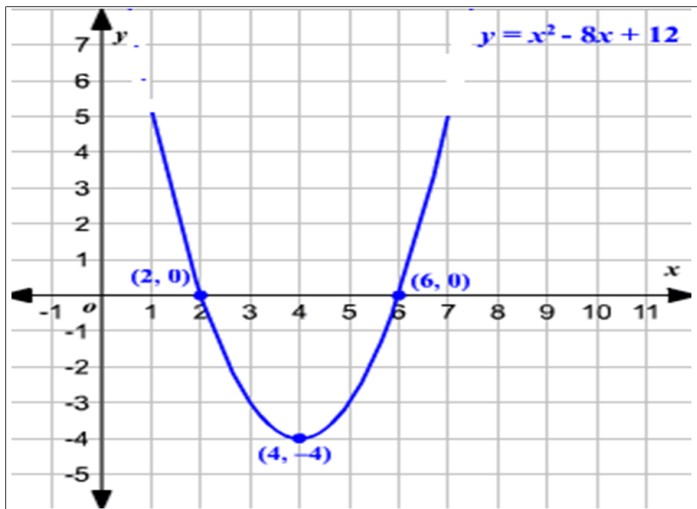
Equation: $f(x) = 5x + 3$

Table:

Input	Output
10	15
20	45
30	25
40	35

Credit: onlinemath4all.com

Graph:



Credit: blogspot.com

There are 3 major topics that are essential to know when beginning functions:

Function Notation, Domain and Range and the Vertical Line Test

We are going to go over each in this order throughout this lesson! This is very important so make sure to pay attention!

Function Notation:

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

For function notation, it is important to understand the purpose of $f(x)$ and x .

Functions deal with plugging in inputs to get out outputs. In this case, x is the number that is plugged into the function (**INPUT**) and $f(x)$ is the **OUTPUT** (or result) that comes out of the function.

$f(x)$ **IS THE SAME** as y so the idea with the functions is plugging in x to get out y .

For instance, if 3 was **INPUTTED** into x in the function above, 2 would be added to the input to get 5 as $f(x)$ or the **OUTPUT**.

For more examples on evaluating functions (plugging in x and getting out $f(x)$), make sure to check out the evaluating functions lesson!

Domain and Range:

Domain refers to all the **X-VALUES** that can be **INPUTTED** to the function.

Range refers to all the **Y-VALUES** that are **OUTPUTS** of the function.

Domain and range are very important when analyzing functions in the form of tables and graphs.

Let's practice one example of each form!

What is the domain and range of the function represented in this table?

x	$f(x)$
1	3
2	6
3	12
4	24

Credit: quizizz.com

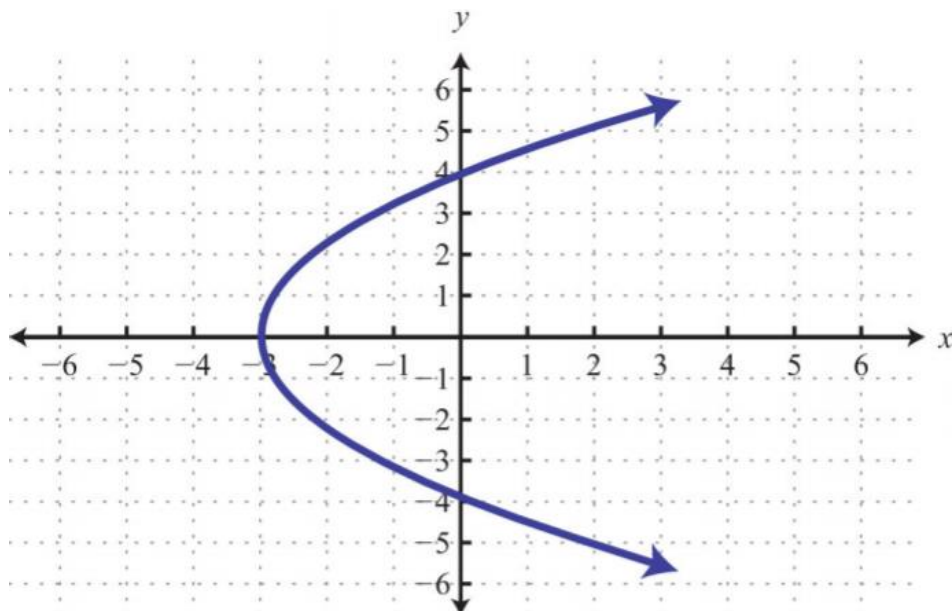
When writing the domain and range for a function in a table, use **SET NOTATION**. Set Notation is where you enclose a set of numbers in curly brackets $\{ \}$.

Remember the domain is all **X-VALUES!** So the domain would be $\{1, 2, 3, 4\}$.

Remember the range is all **Y-VALUES!** So the range would be $\{3, 6, 12, 24\}$.

With a graph, look for how far the function stretches **HORIZONTALLY** for the domain and **VERTICALLY** for the range.

What is the domain and range of the function represented in this graph?



Credit: math.libretexts.org

Since the domain is the x-values, look at how far the function stretches **HORIZONTALLY**. The furthest **LEFT** it goes is -3 and the furthest **RIGHT** it goes is infinity (∞) - The arrows at the end of the function indicate the function extends **INFINITELY**.

Since the range is the y-values, look at how far the function stretches **VERTICALLY**. The furthest **UP** it goes is infinity and the furthest **DOWN** it goes is **NEGATIVE** infinity ($-\infty$) - the arrows are

extending at an angle so the function is going towards infinity.

Set notation for functions from a graph is different from a table. Use $[$ to indicate a value that the function **PASSES** through and use $)$ to indicate a value the function **APPROACHES**.

So the domain is $[-3, \infty)$ and the range is $(-\infty, \infty)$ for the graph on the previous page.

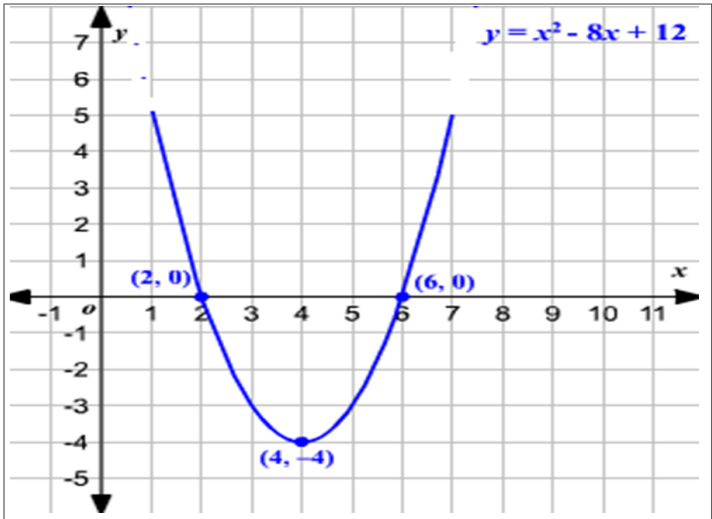
Vertical Line Test:

The Vertical Line Test mainly applies to when you are analyzing functions in the form of graphs.

If you draw a **VERTICAL** line at any X-**COORDINATE** the function passes through, it should only pass through the function **ONCE**.

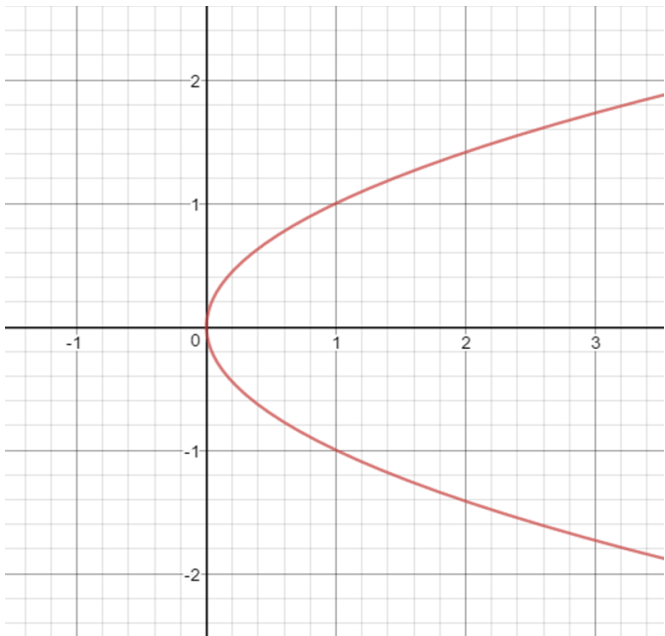
If the vertical line passes through the function **MORE THAN ONCE**, it is **NOT** a function.

Function:



Credit: [blogspot.com](#)

Not a Function:



Credit: [expii.com](#)

A function can pass through a **HORIZONTAL** line more than once, but not a **VERTICAL** line.

Tips for Solving Problems:

1. We use the Vertical Line Test because every input to a function has only **ONE** output (in graph terms, every **X-COORDINATE** has only ONE **Y-COORDINATE**). It is okay for 1 **Y-COORDINATE** to match up with 2 or more **X-COORDINATES** but not the other way around.

2. The domain is all of the **X-VALUES/INPUTS** of a function while the range is all of the **Y-VALUES/OUTPUTS** of a function. This is important to know for all forms of functions that you are dealing with.

3. Remember if the graph you are dealing with has arrows at the end, it is extending **INFINITELY** in the direction the arrows are pointing. If the arrows are pointing diagonally (not horizontally or vertically), the domain and range includes all the numbers in the direction of the arrows.