Functions

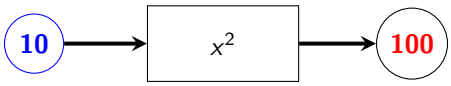
Summary

1. Functions take a single input value and produce a single output value.
2. Interval notation can be used in place of inequalities.
3. When finding domain, you can't divide by 0 or take the square root of a negative number.

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,

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

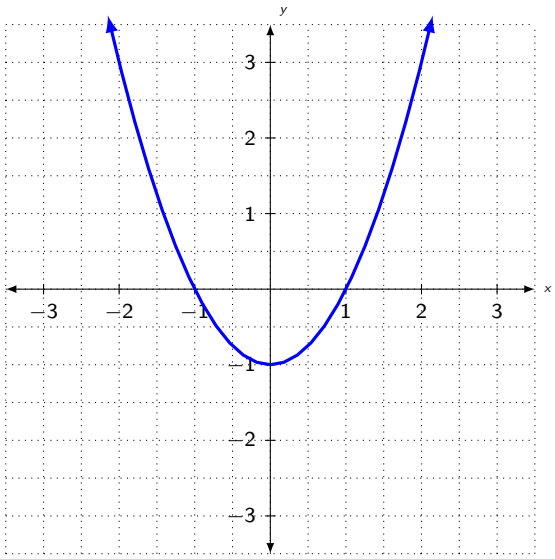
When we substitute a value for the variable and evaluate it, that is called **evaluating the function**.

Example 1. Evaluate $f(2)$, $f(-2)$, and $f(0)$ for each.

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

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

(c)

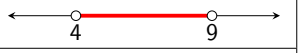


(d)

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

Interval Notation

We often use interval notation to denote the domain and range of a function.

Interval Notation	Set-Builder Notation	Graph
$(4, 9)$	$\{x \mid 4 < x < 9\}$	
$[4, 9]$	$\{x \mid 4 \leq x \leq 9\}$	
$[4, 9)$	$\{x \mid 4 \leq x < 9\}$	
$(4, 9]$	$\{x \mid 4 < x \leq 9\}$	
$(4, \infty)$	$\{x \mid x > 4\}$	
$[4, \infty)$	$\{x \mid x \geq 4\}$	
$(-\infty, 9)$	$\{x \mid x < 9\}$	
$(-\infty, 9]$	$\{x \mid x \leq 9\}$	
$(-\infty, \infty)$	$\mathbb{R}$	
$\varnothing$	$\{\,\}$	

Domain of a Function

The **domain** of a function is the set of all possible *input* values that we are allowed to plug in to a function.

The **range** of a function is the set of all possible *output* values that we get from the function.

2 Domain Issues:

- Can't divide by 0. $\frac{}{\neq 0}$
- Can't take the square root of a negative number. $\sqrt{\geq 0}$

Example 2. Determine the domain of each. Write your answer using interval notation.

(a) $f(x) = \sqrt{5x - 2}$

(b) $g(x) = \frac{3}{x^2 - 4x}$