

# Functions

## Properties

*Domain:* Values of the independent variable ( $x$ ).

*Range:* Values of the dependent variable ( $y$ ).

*Increasing:* Interval of the domain where the variables go in the same direction.

*Decreasing:* Interval of the domain where the variables go in opposite directions.

*Positive:* Interval of the domain for which the dependent variables are positive.

*Negative:* Interval of the domain for which the dependent variables are negative.

*Zero:* Value(s) of the independent variable for which the dependent variable equals 0 (also called  $x$ -intercept).

*$y$ -intercept:* Value of the dependent variable when the independent variable is equal to 0 (also called initial value or value at zero).

*Maximum:* Highest value of the dependent variable.

*Minimum:* Lowest value of the dependent variable.

## Function Parameters

We can transform a **basic** or **parent function** by changing the **parameters** :  $a$ ,  $b$ ,  $h$  &  $k$ .

Parameter  $h$  causes a translation or shift of the function to the left or to the right.

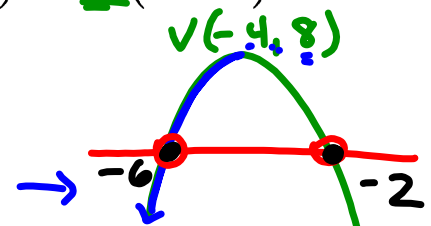
$h > 0$  shift to the right

$h < 0$  shift to the left

The rule or equation is written  $(x - h)$ .

Study the following function:  $f(x) = -2(x+4)^2 + 8$

Domain	$\mathbb{R}$
Range	$]-\infty, 8]$
Increasing	$]-\infty, -4]$
Decreasing	$[-4, +\infty[$
Positive	$[-6, -2]$
Negative	$]-\infty, -6] \cup [2, +\infty[$
Zeros $y=0$	$\{-6, -2\}$
$y$ - intercept $x=0$	$-24$
Maximum	$8$
Minimum	None



$$y = -2(x+4)^2 + 8$$

$$0 = -2(x+4)^2 + 8$$

$$-8 = -2(x+4)^2$$

$$4 = (x+4)^2$$

$$\pm 2 = x+4$$

$$\pm 2 - 4 = x$$