

HORIZONTAL AND VERTICAL TRANSLATIONS

Part 1 GRAPHING CALCULATORS

Use the graphing calculators to graph each of the image equations. Fill in the 'description' column of the following chart:

Basic Graph	Image	Description of Transformation
$y = x^2$ 	$y = x^2 - 4$	Moved 4 units down.
$y = x^3$ 	$y = (x - 1)^3$	Moves 1 unit right.
$y = \frac{1}{x}$ 	$y = \frac{1}{x} + 4$	Up 4 units.
$y = x $ 	$y = x + 2 $	2 units left.
$y = x^2$ 	$y = (x - 2)^2 + 1$	2 units right 1 up.
$y = \sqrt{x}$ 	$y = \sqrt{x + 3} - 2$	3 units left 2 down.
$y = x $ 	$y = x - 4 - 1$	4 units right 1 down.

RULE

For the general function $y = f(x)$:

- | | |
|----------------|----------------------------------|
| $y = f(x) + k$ | moves graph k units up |
| $y = f(x) - k$ | moves graph k units down |
| $y = f(x - h)$ | moves graph h units to the right |
| $y = f(x + h)$ | moves graph h units to the left |

Part 2 MAPPING NOTATION

In order to create image graphs of functions, we need a method or technique to translate the original points from the basic graph into the new points for the image graph. We can use mapping notation!

Example Graph the function $y = (x - 3)^2 + 2$

right 3, up 2

MAPPING NOTATION $(x, y) \longrightarrow (x+3, y+2)$

BASIC GRAPH

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

IMAGE GRAPH

x	y
0	11
1	6
2	3
3	2
4	3
5	6
6	11

REFLECTIONS

Part 1 GRAPHING CALCULATORS

Use the graphing calculators to graph each of the image equations. Fill in the 'description' column of the following chart:

Basic Graph	Image	Description of Transformation
$y = x^2$	$y = -x^2$	Reflection over x-axis.
$y = x^3$	$y = (-x)^3$	Reflects over y-axis
$y = x^3$	$y = -x^3$	Reflection over x-axis.
$y = x $	$y = - x+2 $	Reflection over x-axis, moves to left 2 units.
$y = x^2$	$y = -(x-2)^2 + 1$	Reflects over x-axis, 2 units right, 1 unit up.
$y = \sqrt{x}$	$y = \sqrt{-x+3}$ $y = \sqrt{-1(x-3)}$	Reflection over y-axis, 3 units right.
$y = x $	$y = -x+3 -2$ $y = -1(x-3) -2$	Reflection over y-axis right 3, down 2.

RULE

For the general function $y = f(x)$:

- | | |
|-------------|--------------------------------|
| $y = -f(x)$ | reflects graph over the x-axis |
| $y = f(-x)$ | reflects graph over the y-axis |

Part 2 MAPPING NOTATION

Example 1: Graph the function $y = - (x + 1)^2 - 2$

MAPPING NOTATION $(x,y) \longrightarrow (x-1, -y-2)$

Example 2: Graph the function $y = |-x + 3| + 1$

** Simplify by factoring $y = |-(x-3)| + 1$

MAPPING NOTATION $(x,y) \longrightarrow (-x+3, y+1)$

Example 3: Graph the function $y = -\sqrt{x-2} - 3$

MAPPING NOTATION $(x,y) \longrightarrow (x+2, -y-3)$