

## Math 121

### Section 1.2 Graphing Equations

#### Sketching Graphs

#### Basic Families of Graphs

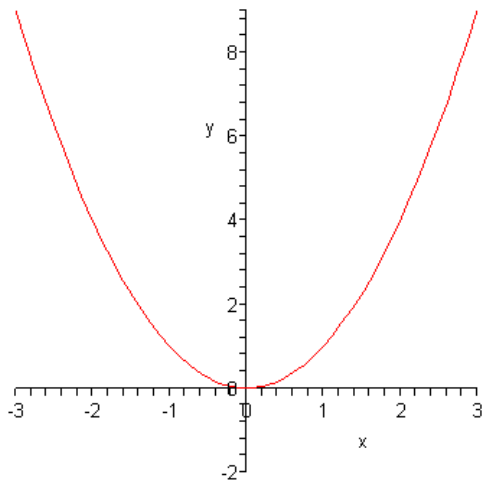
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##### Example 1 (The Standard Parabola)

Graph  $y = x^2$

x	y
-2	$(-2)^2 = 4$
-1	$(-1)^2 = 1$
0	$(0)^2 = 0$
1	$(1)^2 = 1$
2	$(2)^2 = 4$

Plot the following values  $(-2,4),(-1,1),(0,0),(1,1),(2,4)$  from the table will give the following graph.



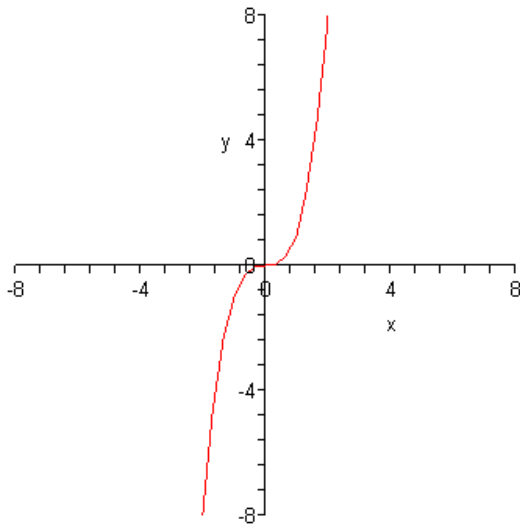
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**Example 2** (The standard “cubic” graph)

Graph  $y = x^3$

$x$	$y = x^3$
-2	$(-2)^3 = -8$
-1	$(-1)^3 = -1$
0	$0^3 = 0$
1	$1^3 = 1$
2	$2^3 = 8$

Plot the values from the table will result in the following graph



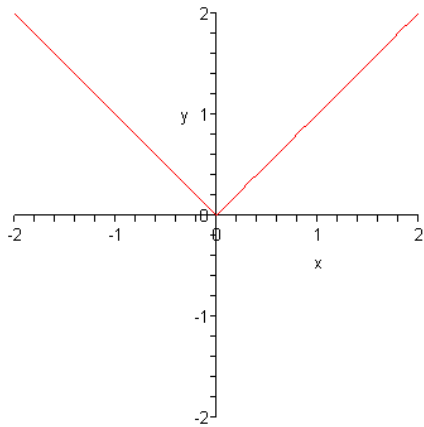
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**Example 3** (The Standard Absolute Value Graph)

Graph  $y = |x|$

$x$	$y =  x $
-2	$ -2  = 2$
-1	$ -1  = 1$
0	$ 0  = 0$
1	$ 1  = 1$
2	$ 2  = 2$

Plot the values from the table will give you a v-shaped graph



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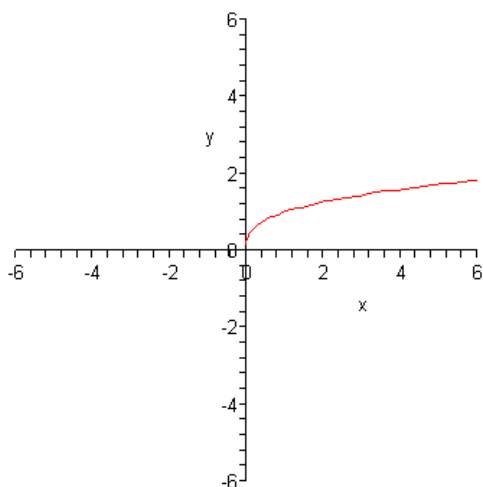
**Example 4** (Standard Square Root Graph)

Graph  $y = \sqrt{x}$

Again, use a table of values to make a graph of the equation

$x$	$y = \sqrt{x}$
0	$\sqrt{0} = 0$
1	$\sqrt{1} = 1$
4	$\sqrt{4} = 2$
9	$\sqrt{9} = 3$

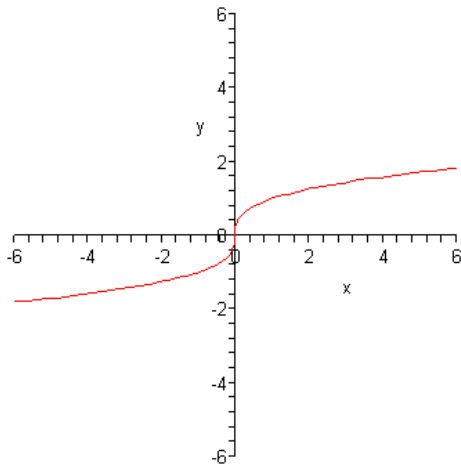
Resulting Graph



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**Example 5**

The graph of  $y = \sqrt[3]{x}$



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**Horizontal and Vertical Translations (Shifts)**

**Horizontal Translation:** An operation that moves the graph of an equation to the left or right while at the same time preserves the shape of the graph.

**Vertical Translation:** An operation that moves the graph of an equation to the left or right while at the same time preserves the shape of the graph.

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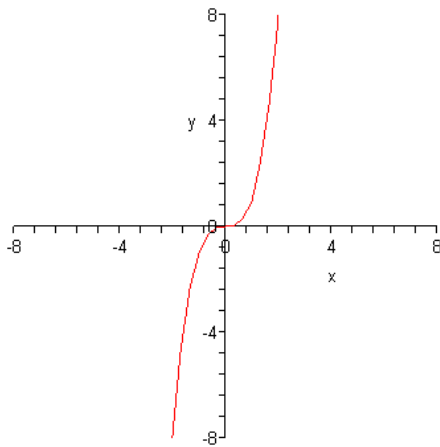
### Example 6

Example of a Vertical Translation

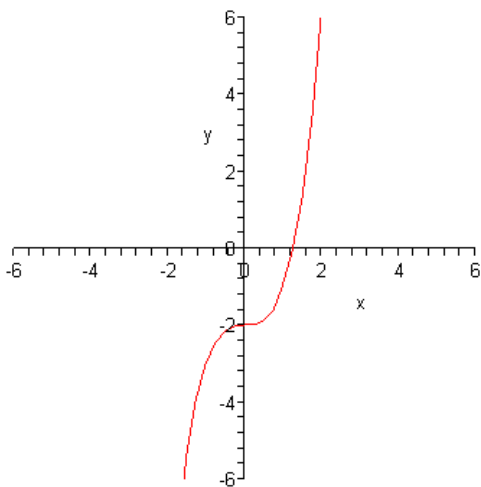
$$y = x^3 - 2$$

Since the  $-2$  lies outside the  $x^3$  term, the value  $-2$  indicates a vertical translation of 2 units. The negative sign in value of  $-2$  indicates that the translation will move the graph of  $y = x^3$  down two units as shown below:

The graph of  $y = x^3 - 2$



The graph of  $y = x^3 - 2$  shifted down to units



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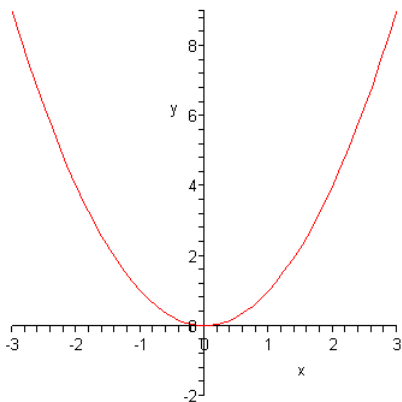
### Example 7

Example of a Horizontal Translation

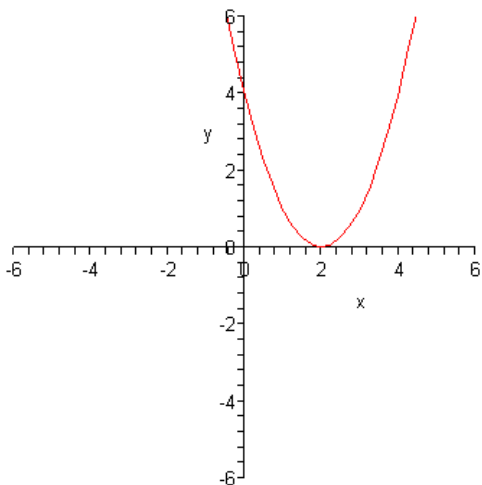
$$y = (x - 2)^2$$

In this example, the  $-2$  inside the parentheses indicates that there is a horizontal translation of two units to the right. A negative sign inside the parentheses will always result in a shift to the right.

The original graph of  $y = x^2$



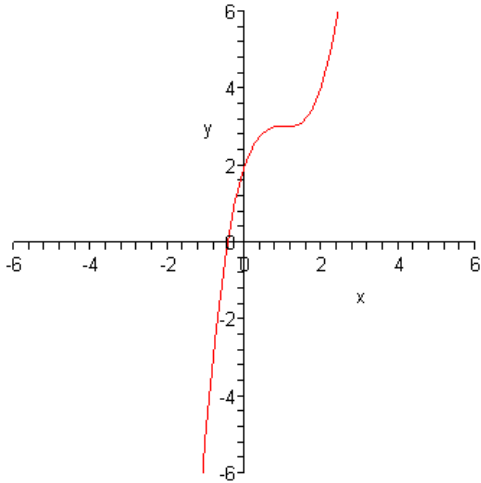
The graph of  $y = x^2$  after a horizontal translation of 2 units to the right



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**Example 8**

The graph of  $y = (x-1)^3 + 3$



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**Example 9** The graph of  $y = -x^2$ 

The graph of  $y = -x^2$  is the inverted graph of  $y = x^2$ . The negative sign in front of the  $x^2$  term simply turns the graph of  $y = x^2$  upside down.

