

Math 121

Section 1.2 Graphing Equations

Sketching Graphs

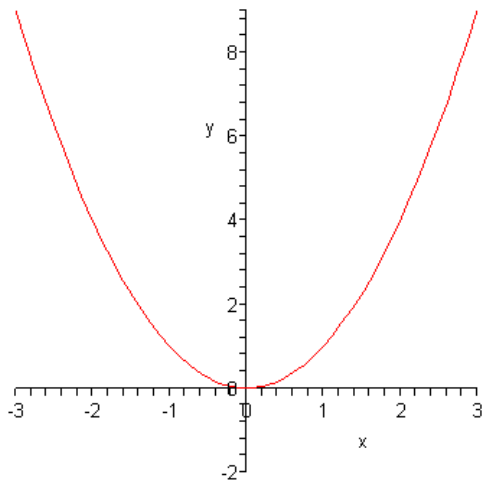
Basic Families of Graphs

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.

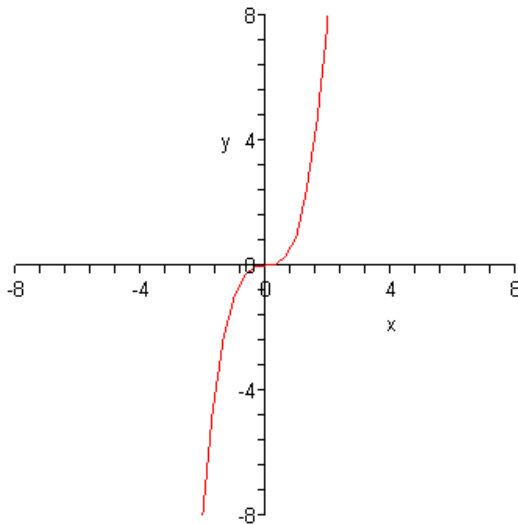


Example 2 (The standard “cubic” graph)

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

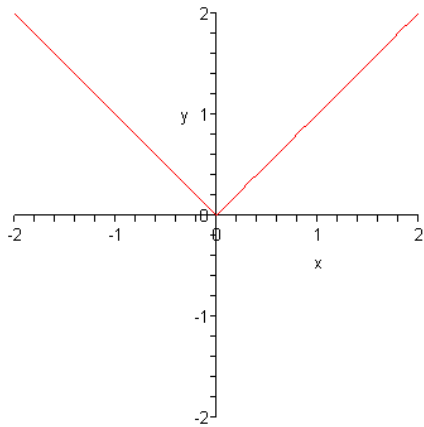


Example 3 (The Standard Absolute Value Graph)

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



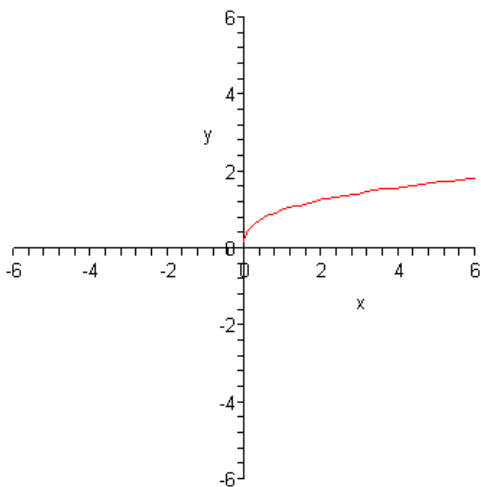
Example 4 (Standard Square Root Graph)

Graph $y = \sqrt{x}$

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

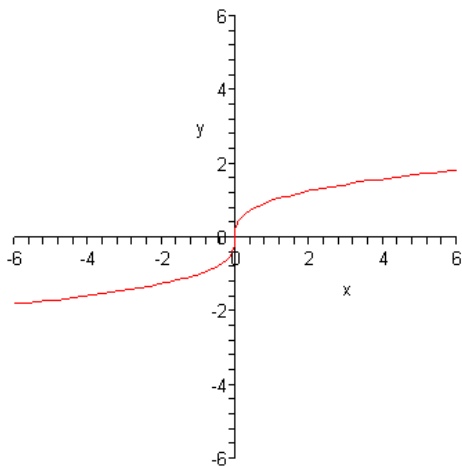
x	$y = \sqrt{x}$
0	$\sqrt{0} = 0$
1	$\sqrt{1} = 1$
4	$\sqrt{4} = 2$
9	$\sqrt{9} = 3$

Resulting Graph



Example 5

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



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.

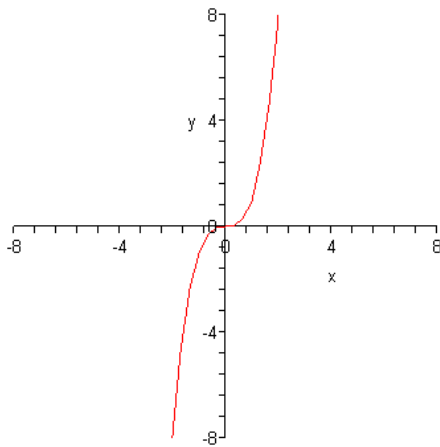
Example 6

Example of a Vertical Translation

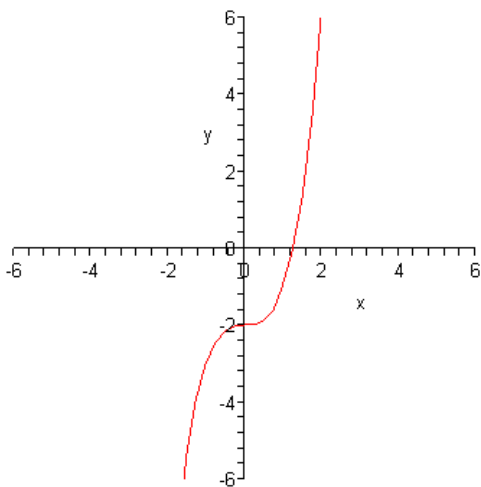
$$y = x^3 - 2$$

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



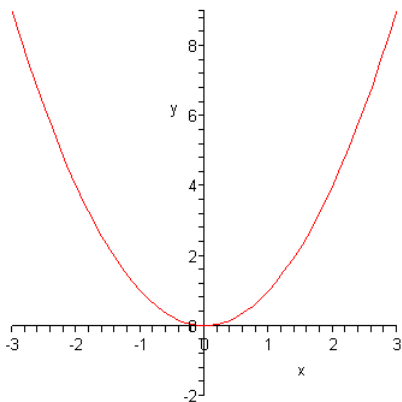
Example 7

Example of a Horizontal Translation

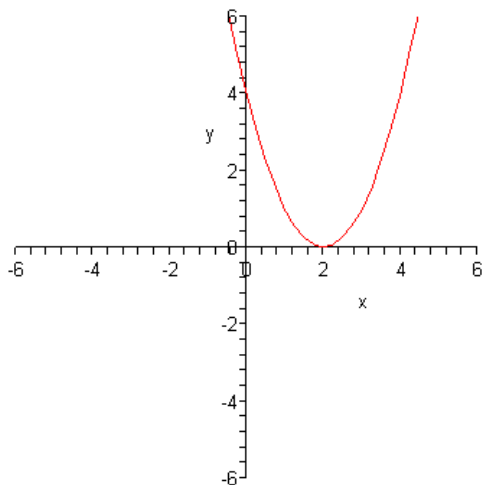
$$y = (x - 2)^2$$

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 $y = x^2$

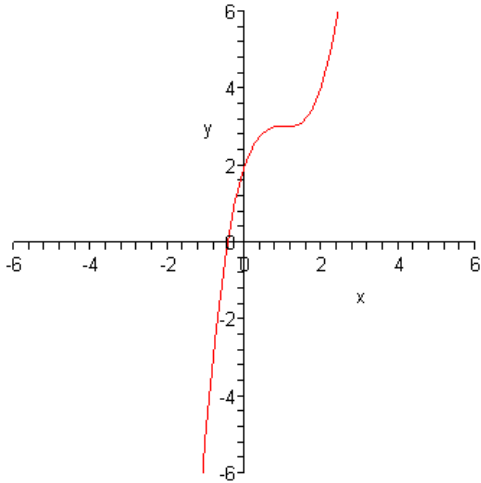


The graph of $y = x^2$ after a horizontal translation of 2 units to the right



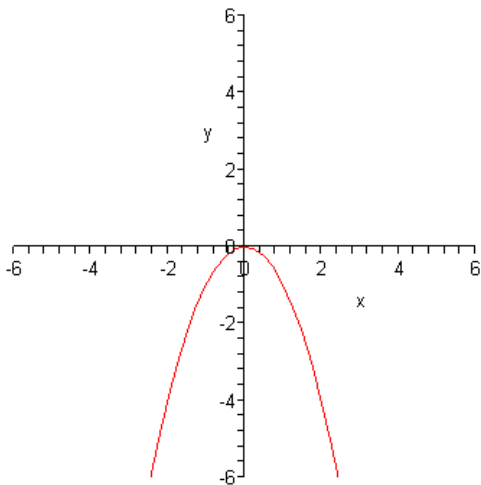
Example 8

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



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.



Finding the Intercepts

Example 10

Sketch a graph of the equation. Find the intercepts.

$$y = x^2 - 4$$

x-intercept

$$\text{Let } y = 0$$

$$0 = x^2 - 4$$

$$0 = (x - 2)(x + 2)$$

$$x - 2 = 0 \text{ or } x + 2 = 0$$

$$x = 2 \quad x = -2$$

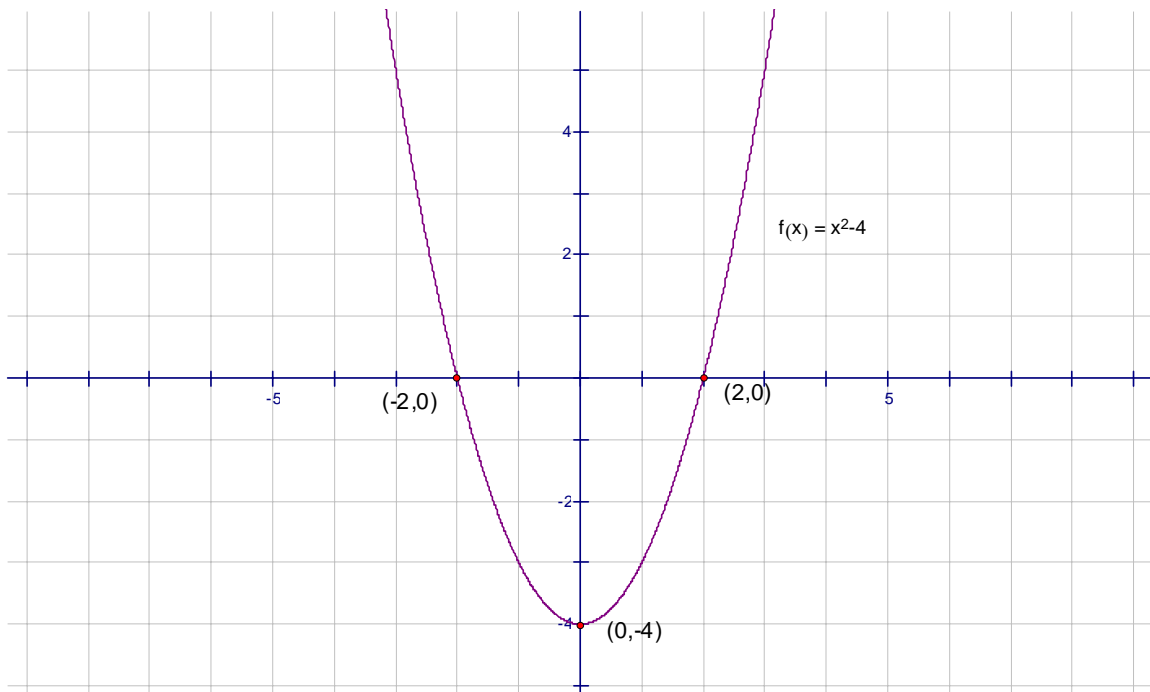
$$(2, 0) \quad (-2, 0)$$

y-intercept

$$y = 0 - 4$$

$$y = -4$$

$$(0, -4)$$



Example 11

Sketch a graph of the equation. Find the intercepts.

$$y = x^3 + 1$$

Intercepts

Let $y = 0$

$$0 = x^3 + 1$$

$$x^3 = -1$$

$$\sqrt[3]{x^3} = \sqrt[3]{-1}$$

$$x = -1$$

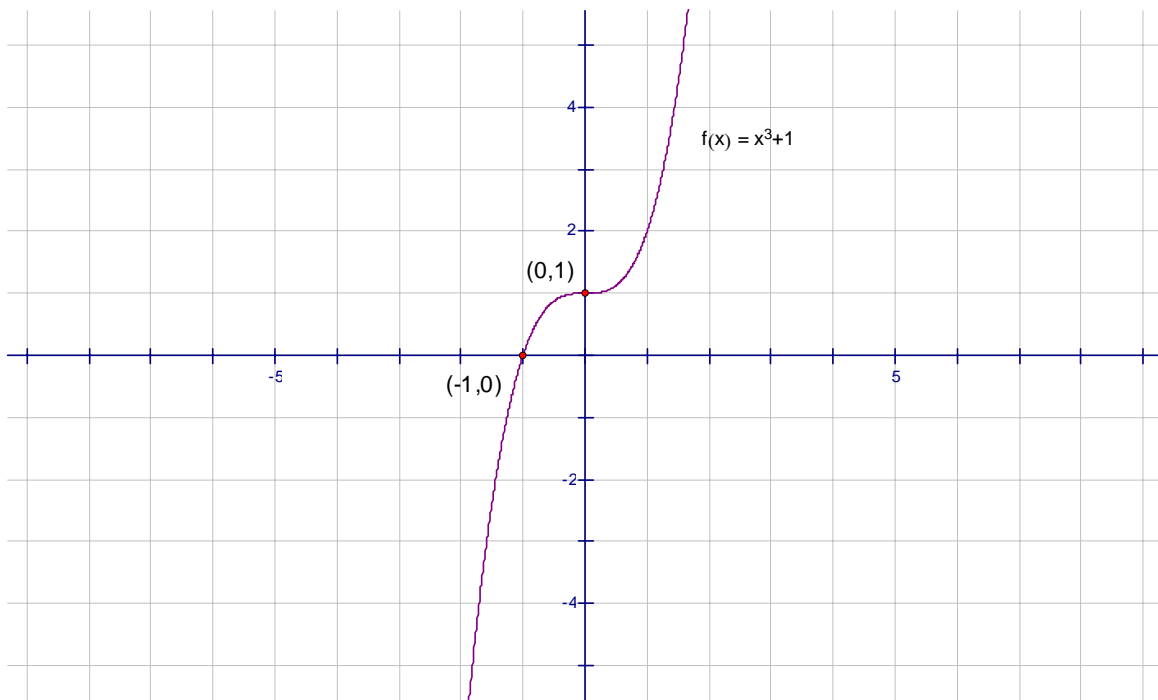
$$(-1, 0)$$

Let $x = 0$

$$y = 0^3 + 1$$

$$y = 1$$

$$(0, 1)$$



Example 13

Sketch a graph of the following function. Label all intercepts

$$y = 2x - 4$$

Intercepts

$$\text{Let } y = 0$$

$$0 = 2x - 4$$

$$2x = 4$$

$$\frac{2x}{2} = \frac{4}{2}$$

$$x = 2$$

$$(2,0)$$

$$\text{Let } x = 0$$

$$y = 2(0) - 4$$

$$y = -4$$

$$(0,-4)$$

