A Library of Functions

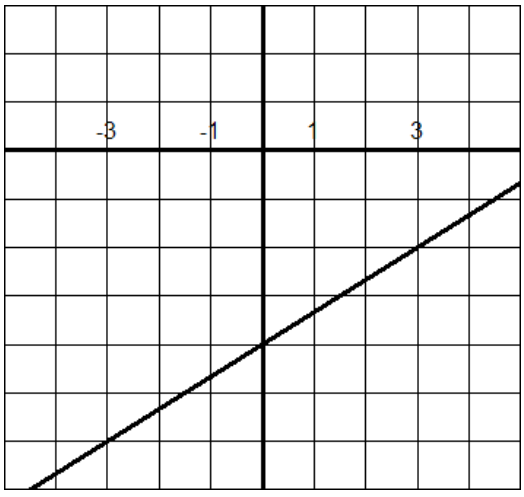
Linear Functions

The graph of every linear function $f(x) = mx + b$ is a line with slope = m and y-intercept (0, b). The graph of a linear function has the following features:

- Domain: All real numbers
- Range: All real numbers
- One y-intercept at (0, b)
- The graph is increasing if $m>0$, decreasing if $m<0$, and constant if $m = 0$.

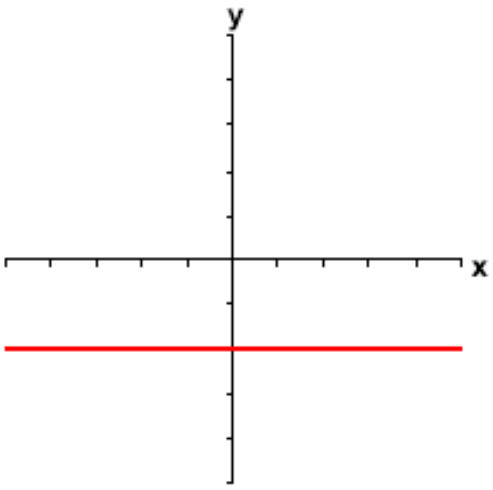
Example: Graph the linear function $y = \frac{2}{3}x - 4$.

Solution: The slope is $\frac{2}{3}$ and y-intercept (0,-4).



There are 2 special linear functions:

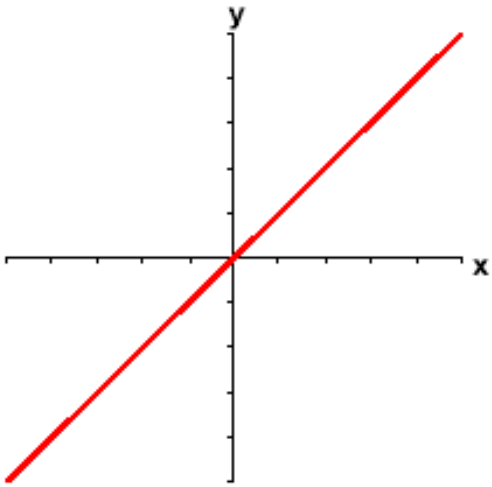
Constant Function



A constant function has the form $f(x) = c$.

The graph is a horizontal line.

Identity Function



The identity function has the form $f(x) = x$.

The graph is a line with slope 1 and passing through the origin.

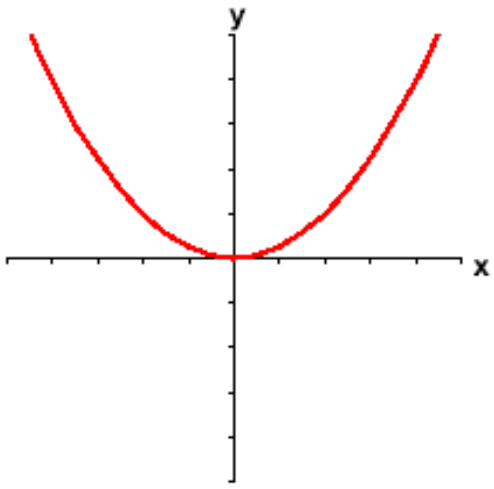
Squaring (Quadratic) Functions

The graph of the squaring function (quadratic) is a U-shaped curve called a parabola.

The graph of the squaring function has the following features:

- Domain: All real numbers
- Range: All nonnegative real numbers
- Intercept at (0, 0)
- Decreasing on $(-\infty, 0)$
- Increasing on $(0, \infty)$
- Symmetric with respect to the y-axis
- Relative minimum at (0, 0)

Quadratic Function



$$f(x) = x^2$$

Greatest Integer Function

The greatest integer function, denoted by $y = [x]$ where

$$[x] = \text{the greatest integer} \leq x$$

(If the number is *not* an integer, we want the integer to the left of that number on the number line.)

This is commonly referred to as a step function. It is the type of function telephone companies use to bill us for long distance calls or cell phone minutes.

Example: Find the following:

a) [3]

solution: 3

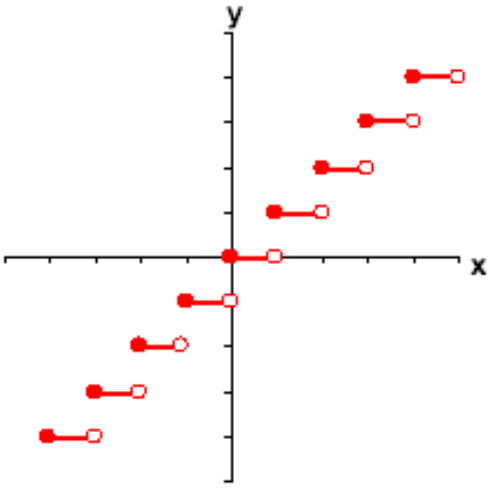
b) [5.9]

solution: 5

c) [-4.2]

solution: -5

Greatest Integer Function



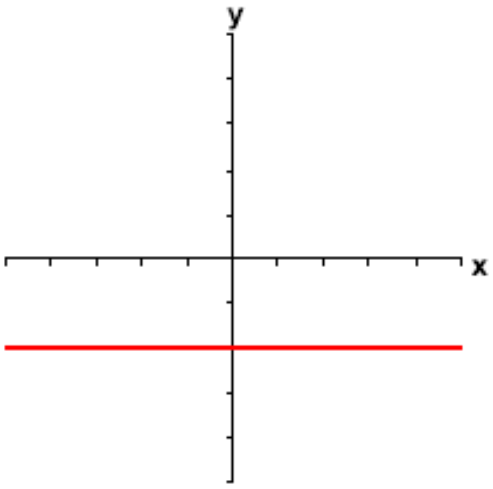
$$y = [x]$$

Common Functions

The 8 most common functions are:

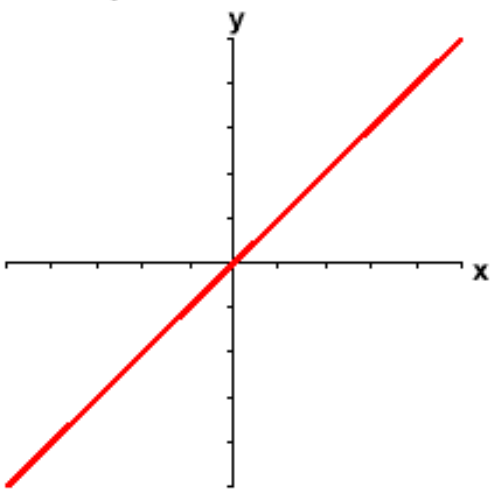
- The constant function, $f(x) = c$
- The identity function, $f(x) = x$
- The absolute value function $f(x) = |x|$
- The square root function, $f(x) = \sqrt{x}$
- The quadratic function, $f(x) = x^2$
- The cubic function, $f(x) = x^3$
- The reciprocal function, $f(x) = \frac{1}{x}$
- The greatest integer function, $f(x) = [x]$

Constant Function



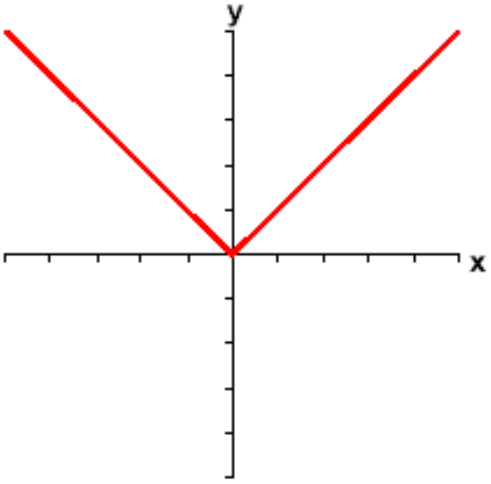
$$f(x) = c$$

Identity Function



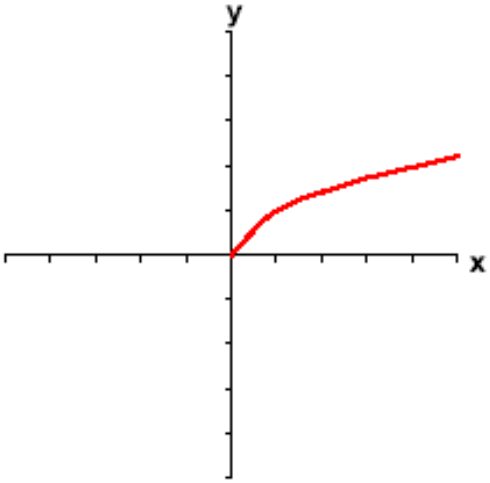
$$f(x) = x$$

Absolute Value Function



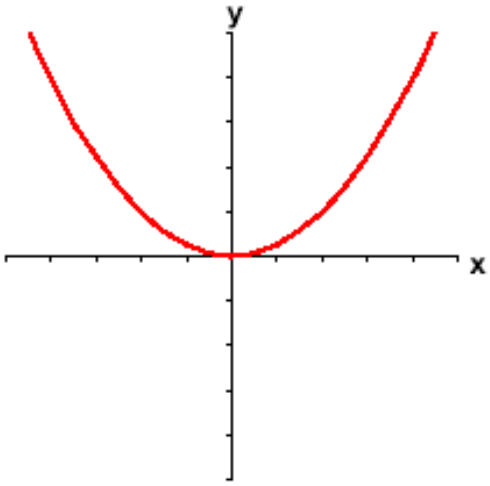
$$f(x) = |x|$$

Square Root Function



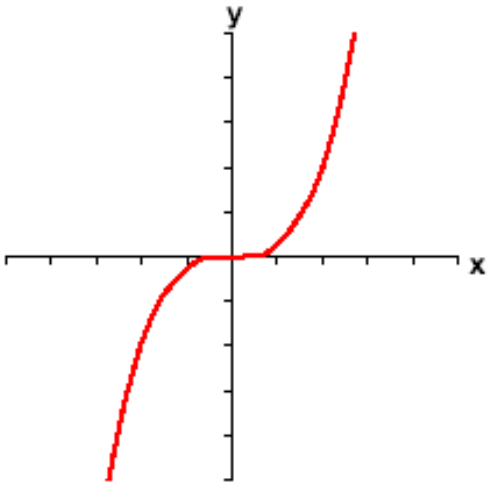
$$f(x) = \sqrt{x}$$

Quadratic Function



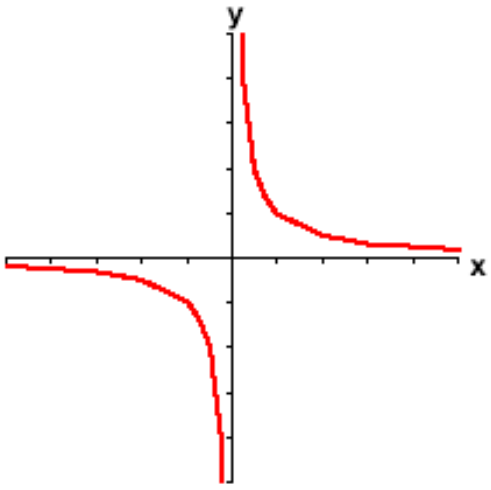
$$y = x^2$$

Cubic Function



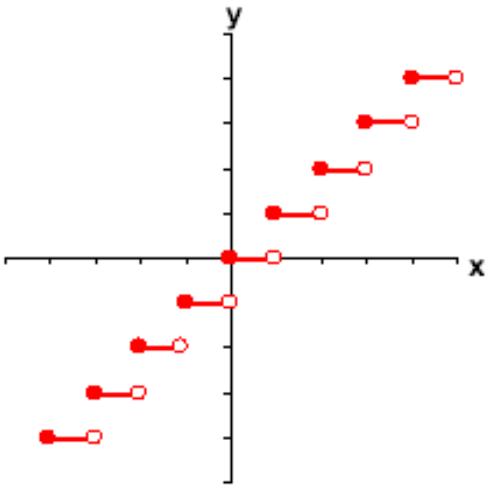
$$y = x^3$$

Reciprocal Function



$$f(x) = \frac{1}{x}$$

Greatest Integer Function



$$f(x) = [x]$$

Common Functions on the Graphing Calculator

Absolute Value: [MATH] [NUM] [abs( ]

Square Root Function: [2nd] [x^2]

Quadratic Function: [x^2]

Cubic Function: [MATH] [^{3}]

Reciprocal Function: [x^{-1}]

Greatest Integer Function: [MATH] [NUM] [int( ]

Note: When graphing the Greatest Integer Function, you must graph in DOT mode, not CONNECTED mode. Press [MODE] and highlight DOT on the 5th line down. Press [ENTER] and then [QUIT], which is [2nd] [MODE].