

Write in here your summary of each of the important transformations of functions and the effects they have on the graph of the function:

- Adding a number  $c$  to the output (Adding a number  $c$  to the value of the function):

Compared to the graph of  $y = f(x)$ , the graph of  $y = f(x) + c$  is shifted up or down by  $c$  units, depending on whether  $c$  is positive or negative.

- Adding a number  $c$  to the input (Inputting  $x + c$  in place of  $x$ ):

Compared to the graph of  $y = f(x)$ , the graph of  $y = f(x + c)$  is shifted to the left or to the right by  $c$  units, **to the left if  $c$  is negative, to the right if  $c$  is positive.**

- Multiplying the output by a positive number  $c$  (Multiplying the value of the function by a positive number  $c$ ):

Compared to the graph of  $y = f(x)$ , the graph of  $y = c \cdot f(x)$  is stretched or compressed vertically; stretched away from the x-axis if  $c > 1$ , or compressed toward the x-axis if  $c$  is between 0 and 1.

- Multiplying the input by a positive number  $c$  (Inputting  $cx$  in place of  $x$ ):

Compared to the graph of  $y = f(x)$ , the graph of  $y = f(cx)$  is stretched or compressed horizontally; **compressed toward the y-axis if  $c > 1$ , or stretched away from the y-axis if  $c$  is between 0 and 1.**

- Multiplying the output by -1 (Multiplying the value of the function by -1):

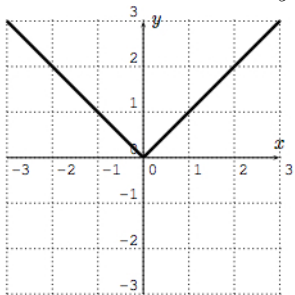
Compared to the graph of  $y = f(x)$ , the graph of  $y = -f(x)$  is reflected across the x-axis

- Multiplying the input by -1 (Inputting  $-x$  in place of  $x$ ):

Compared to the graph of  $y = f(x)$ , the graph of  $y = f(-x)$  is reflected across the y-axis

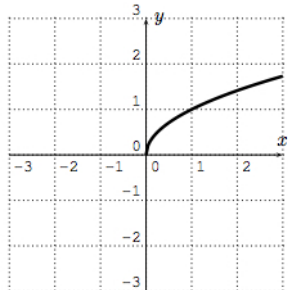
Basic graphs: These are the simplest, most basic examples of these types of functions

- Absolute value function  $y = |x|$



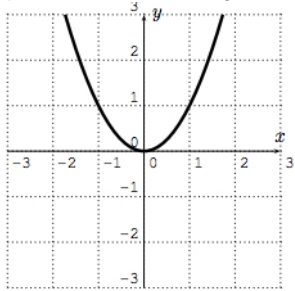
Domain:  $\mathbb{R}$

- Square root function  $y = \sqrt{x}$



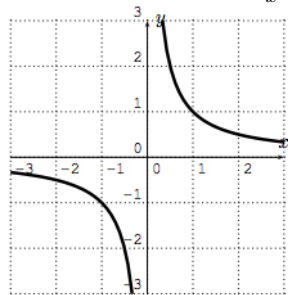
Domain:  $[0, \infty)$

- Quadratic function  $y = x^2$



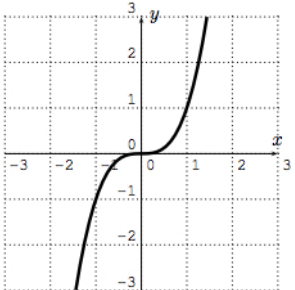
Domain:  $\mathbb{R}$

- Rational function  $y = \frac{1}{x}$



Domain:  $\mathbb{R} \setminus \{0\}$

- Cubic function  $y = x^3$



Domain:  $\mathbb{R}$