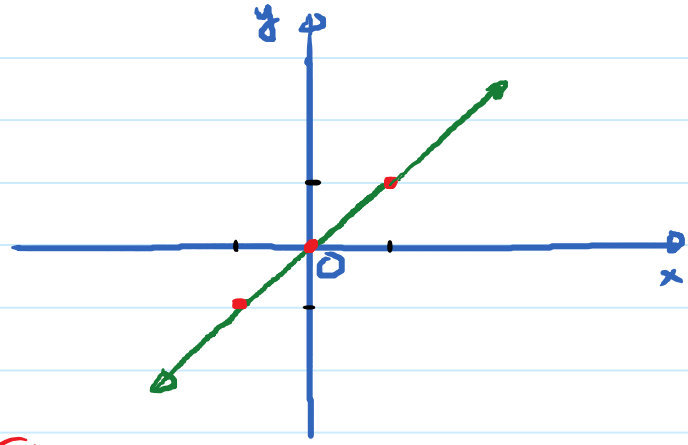
2.5. Transformations of Functions

Thursday, February 13, 2020 9:43 AM

Objective 1: Graphs of Common Functions (Parent Functions)

(1) Constant Function: $f(x) = c$; c is a constant

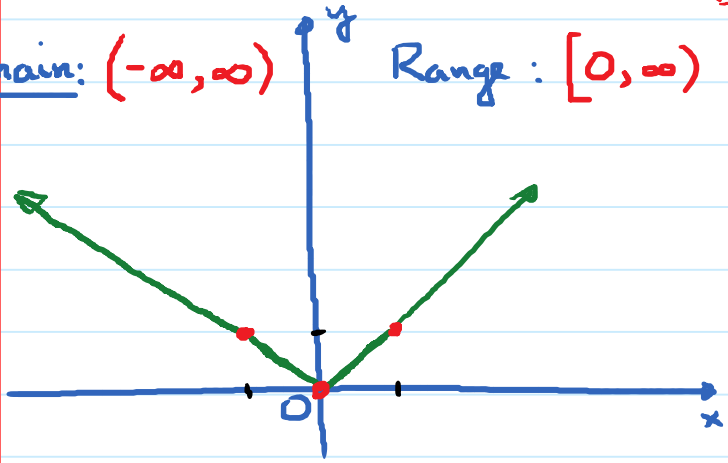
(2) Identity Function: $f(x) = x$



Graph is a straight line with slope = 1.

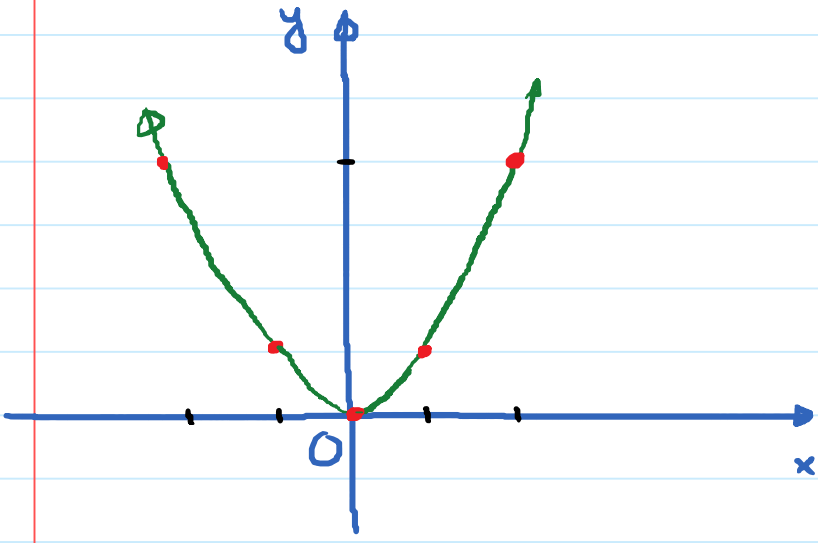
(3) Absolute Value Function: $f(x) = |x|$

Domain: $(-\infty, \infty)$ Range: $[0, \infty)$



x	$y = f(x) = \lvert x \rvert$
-1	$1 \rightarrow (-1, 1)$
0	$0 \rightarrow (0, 0)$
1	$1 \rightarrow (1, 1)$

(4) Standard Quadratic Function: $f(x) = x^2$



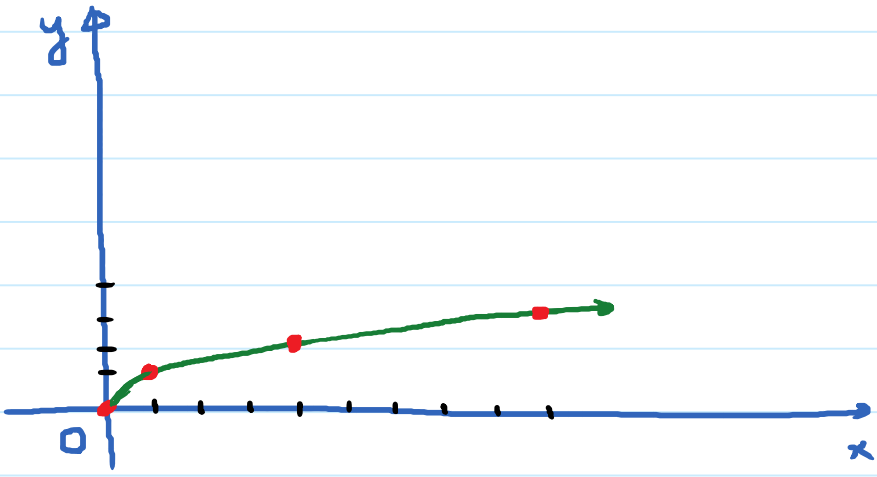
x	$y = f(x) = x^2$
-2	$4 \rightarrow (-2, 4)$
-1	$1 \rightarrow (-1, 1)$
0	$0 \rightarrow (0, 0)$
1	$1 \rightarrow (1, 1)$
2	$4 \rightarrow (2, 4)$

The graph is a parabola.

Domain $= (-\infty, \infty)$; Range $= [0, \infty)$

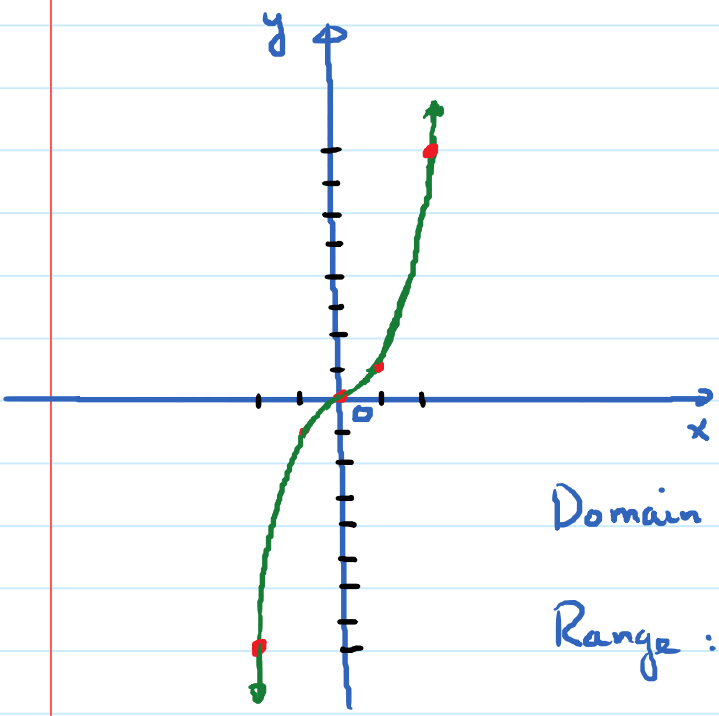
(5) Square Root Function: $f(x) = \sqrt{x}$

x	$f(x) = \sqrt{x}$
0	$0 \rightarrow (0, 0)$
1	$1 \rightarrow (1, 1)$
4	$2 \rightarrow (4, 2)$
9	$3 \rightarrow (9, 3)$
16	$4 \rightarrow (16, 4)$



Domain : $= [0, \infty)$; Range $= [0, \infty)$

(6) Standard cubic function: $f(x) = x^3$



x	$y = f(x) = x^3$
-2	$-8 \rightarrow (-2, -8)$
-1	$-1 \rightarrow (-1, -1)$
0	$0 \rightarrow (0, 0)$
1	$1 \rightarrow (1, 1)$
2	$8 \rightarrow (2, 8)$

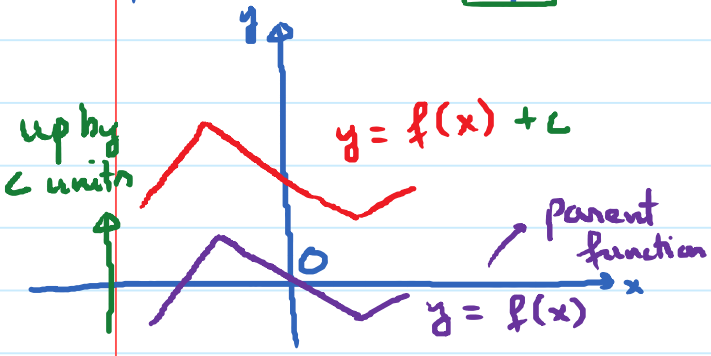
Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

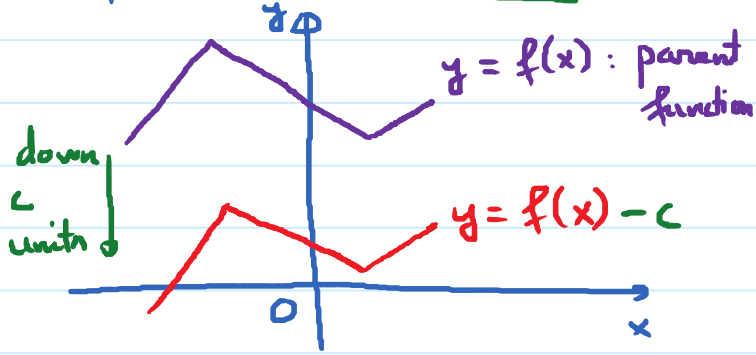
Objective 2: Vertical Shifts

Given a function $y = f(x)$ and c is a positive constant.

The graph of $y = f(x) + c$ is the graph of $y = f(x)$ shifted c units **up**



The graph of $y = f(x) - c$ is the graph of $y = f(x)$ shifted c units **down**



original (parent function)

E.g. Given $y = f(x) = x^2$

(a) Write down the formula for the function $y = f(x) + 2$?

$$y = x^2 + 2$$

(b) Graph both $y = f(x)$ and $y = f(x) + 2$ by making table of values.

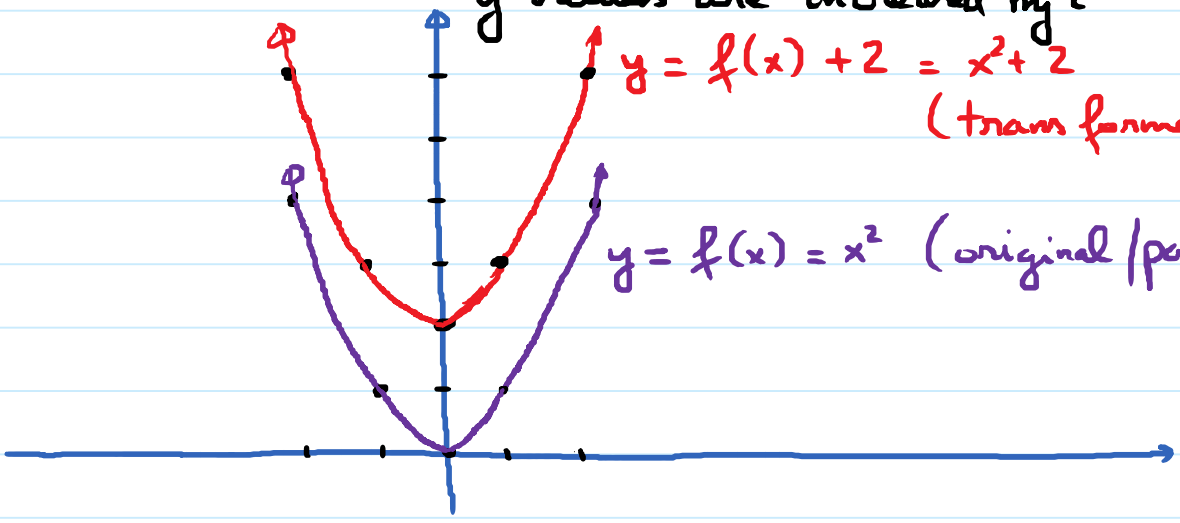
x	$y = f(x) = x^2$
-2	$4 \rightarrow (-2, 4)$
-1	$1 \rightarrow (-1, 1)$
0	$0 \rightarrow (0, 0)$
1	$1 \rightarrow (1, 1)$
2	$4 \rightarrow (2, 4)$

(original/parent)

x	$y = f(x) + 2 = x^2 + 2$
-2	$6 \rightarrow (-2, 6)$
-1	$3 \rightarrow (-1, 3)$
0	$2 \rightarrow (0, 2)$
1	$3 \rightarrow (1, 3)$
2	$6 \rightarrow (2, 6)$

(transformed)

y values are increased by 2



$y = f(x) + 2 = x^2 + 2$ (transformed)

$y = f(x) = x^2$ (original/parent)