Transformations of functions

Wednesday, February 13, 2019 1:01 PM

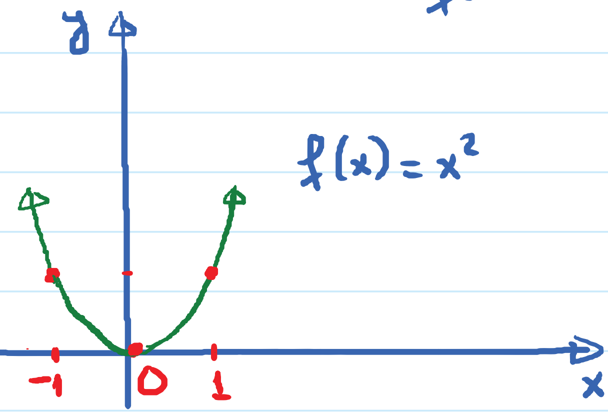
5 basic functions and their graphs

$f(x) = -x^2$

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

x	$f(x)=x^2$	
0	0	$\to (0,0)$
1	1	$\to (1,1)$
-1	1	$\to (-1,1)$

Key points



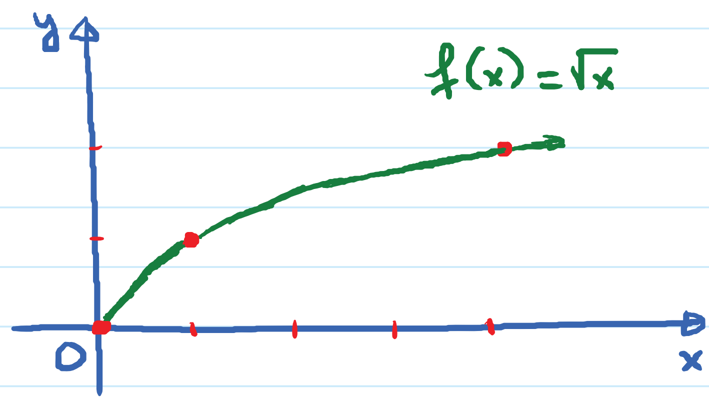
Domain: All real #s ; $(-\infty, \infty)$; $\mathbb{R}$

Range: $[0, \infty)$

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

x	$f(x)=\sqrt{x}$	
0	0	$\to (0,0)$
1	1	$\to (1,1)$
4	2	$\to (4,2)$

Key points



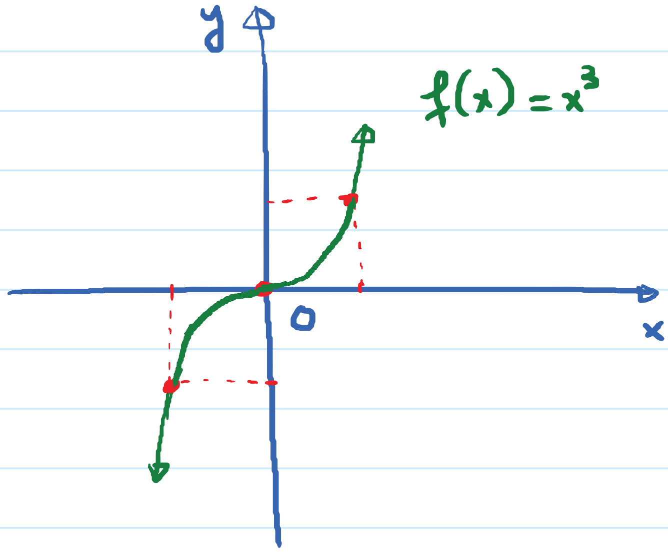
Domain : $[0, \infty)$. Range : $[0, \infty)$

3) $f(x) = x^3$

x	$f(x) = x^3$
0	0
1	1
−1	−1

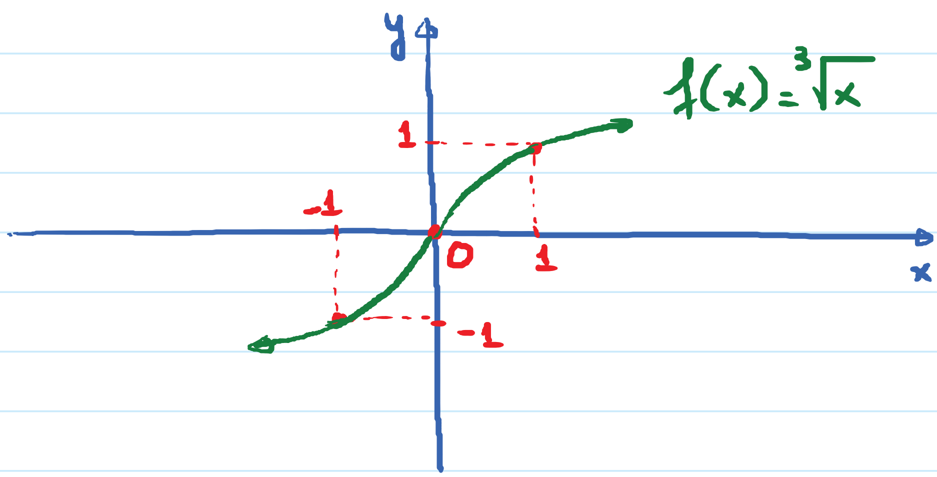
(0,0)
(1,1)
(−1,−1)

Key points



4) $f(x) = \sqrt[3]{x}$

x	$f(x)$
0	0
1	1
−1	−1



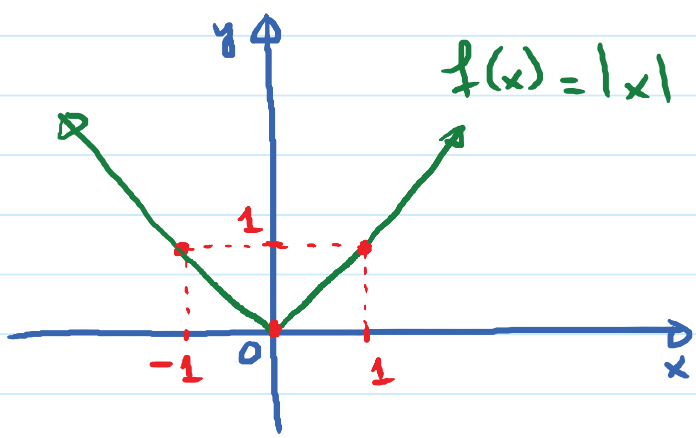
Domain = $(-\infty, \infty)$; Range = $(-\infty, \infty)$

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

x	$f(x) = \lvert x \rvert$
0	0
1	1
−1	1

(0,0)
(1,1)
(−1,1)

Key points



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

What would the graph of $f(x) = 10(x-2)^2 - 7$ look like?

$\longrightarrow$ Graph Transformations.

4 basic types of graph transformations

1 Vertical Shift: A number is added / subtracted to the function: $\boxed{y = f(x) + c}$

(c = constant, $c > 0$: add, $c < 0$: subtract)

A Vertical shift move the graph up or down c units

2 Horizontal Shift: A number is added / subtracted to x in the function. $\boxed{y = f(x + c)}$

(c = constant, $c > 0$: add, $c < 0$: subtract)

A horizontal shift move the graph $\boxed{\text{left}}$ or $\boxed{\text{right}}$ c units

$c > 0$

$c < 0$

③ Vertical stretch / compression.

A number is multiplied to the function.

$$\boxed{y = c \cdot f(x)}$$

(c = constant , $c > 1$: stretch ; $0 < c < 1$: compression)

$c > 1$ $\quad$ $0 < c < 1$

Stretch or compress the graph vertically by a factor of c.

④ Reflection:

ⓐ Negative in front of the function:

$$\boxed{y = -f(x)}$$

Reflect the original function across x-axis

ⓑ Negative in front of the x in the function.

$$\boxed{y = f(-x)}$$

Reflect the original function across y-axis