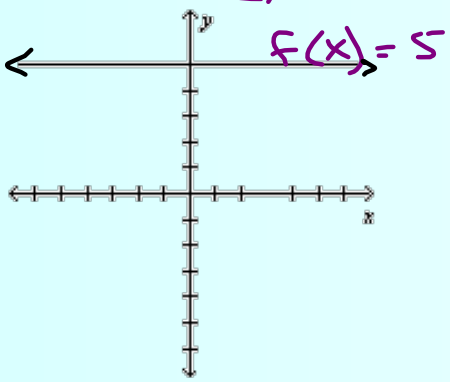
Sec 3.2 Families of Graphs

Parent Graphs

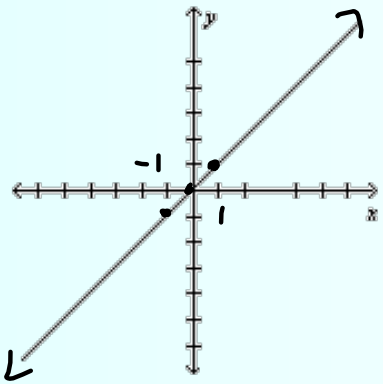
ex. $f(x) = 5$



constant function: $f(x) = c$

Domain: $\mathbb{R}$
Range: c (constant number)

y-intercept: $(0, c)$

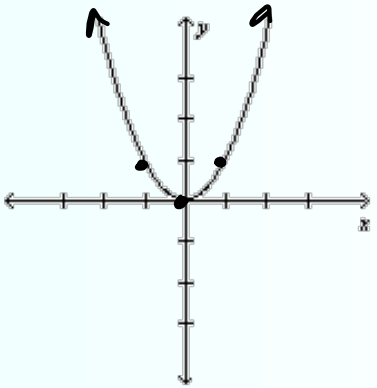


identity function: $f(x) = x$

Domain: $\mathbb{R}$
Range: $\mathbb{R}$

y-intercept: $(0,0)$

key points: $(1,1)$ $(0,0)$ $(-1,-1)$



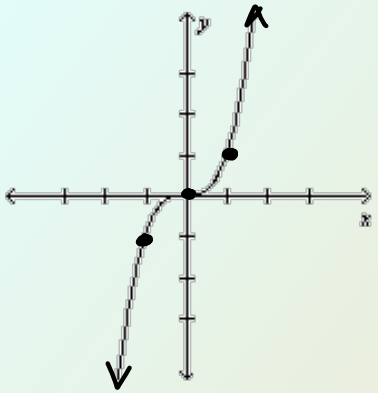
x	y
-1	
0	
1	

quadratic function: $f(x) = x^2$

Domain: $\mathbb{R}$
Range: $y \geq 0$

x- & y-intercept: $(0,0)$

key points: $(1,1)$ $(0,0)$ $(-1,1)$



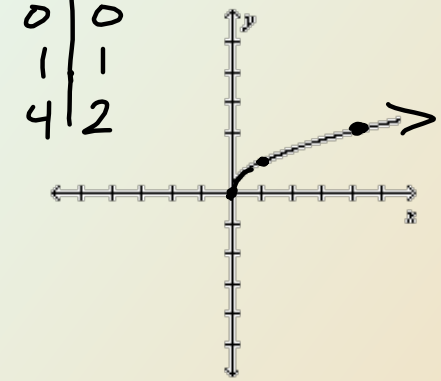
cubic function: $f(x) = x^3$

Domain: $\mathbb{R}$
Range: $\mathbb{R}$

x- & y-intercept:
$(0,0)$

key points:
$(1,1)$ $(0,0)$
$(-1,-1)$

x	y
0	0
1	1
4	2

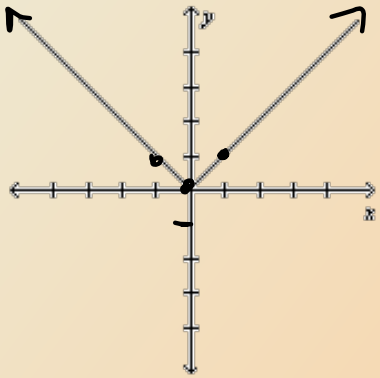


square root function: $f(x) = \sqrt{x}$

Domain: $x \geq 0$
Range: $y \geq 0$

x- & y-intercept:
$(0,0)$

key points:
$(0,0)$, $(1,1)$
$(4,2)$

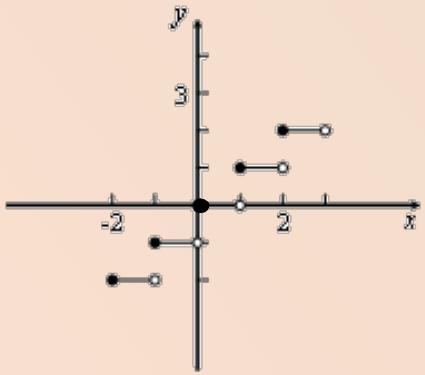


absolute value function: $f(x) = |x|$

Domain: $\mathbb{R}$
Range: $y \geq 0$

x- & y-intercept:
$(0,0)$

key points:
$(1,1)$ $(0,0)$ $(-1,1)$



greatest integer function: $f(x) = [|x|]$

Domain: $\mathbb{R}$

Range: all integers

x- & y-intercept:

y- int (0,0)

x-int (0,0) → (1,0) open

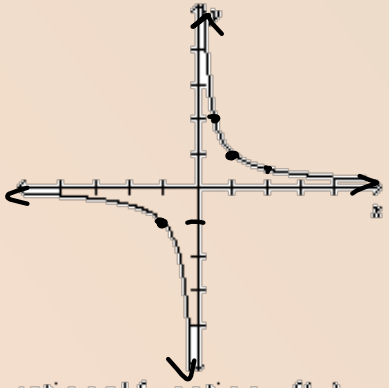
key points:

open

(0,0) → (1,0)

(1,1) → (2,1)

(-1,-1) → (0,-1)



rational function: $f(x) = \frac{1}{x}$

Domain: $x \neq 0$

Range: $y \neq 0$

x- & y-intercept:

none

key points:

$(1,1)\ (2,\tfrac{1}{2})\ (\tfrac{1}{2},2)$

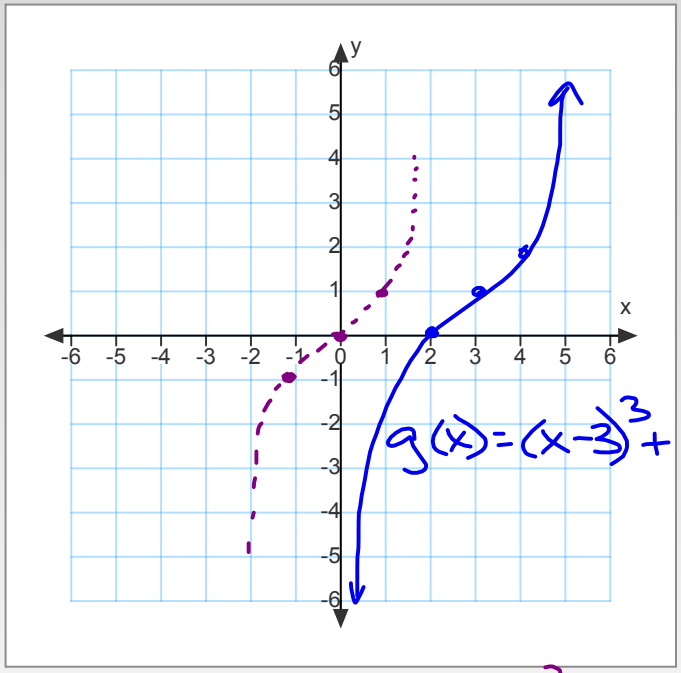
$(-1,-1)\ (-2,-\tfrac{1}{2})\ (-\tfrac{1}{2},-2)$

$x\left(\frac{1}{x}\right) = (0)x$

$1 \neq 0$

no sol.

Ex 1



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

$g(x) = (x-3)^3 + 1$

right 3 ← up 1 unit

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

Transformations of graphs:

graphs appear in a different location but resemble the parent graph.

Reflection: Flips over the **x or y axis**

$f(x) = -x^2$

−f(x) flips over the x-axis

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

f(−x) flips over the y-axis

Translation: Moves the graph up/down or right/left

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

f(x) − c moves the graph **down** c-units

f(x) + c moves the graph **up** c-units $f(x) = x^3 + 1$

f(x − c) moves the graph **right** c units $(x-1)^2$

f(x + c) moves the graph **left** c units

Dilation: **stretches** or **shrinks** the graph

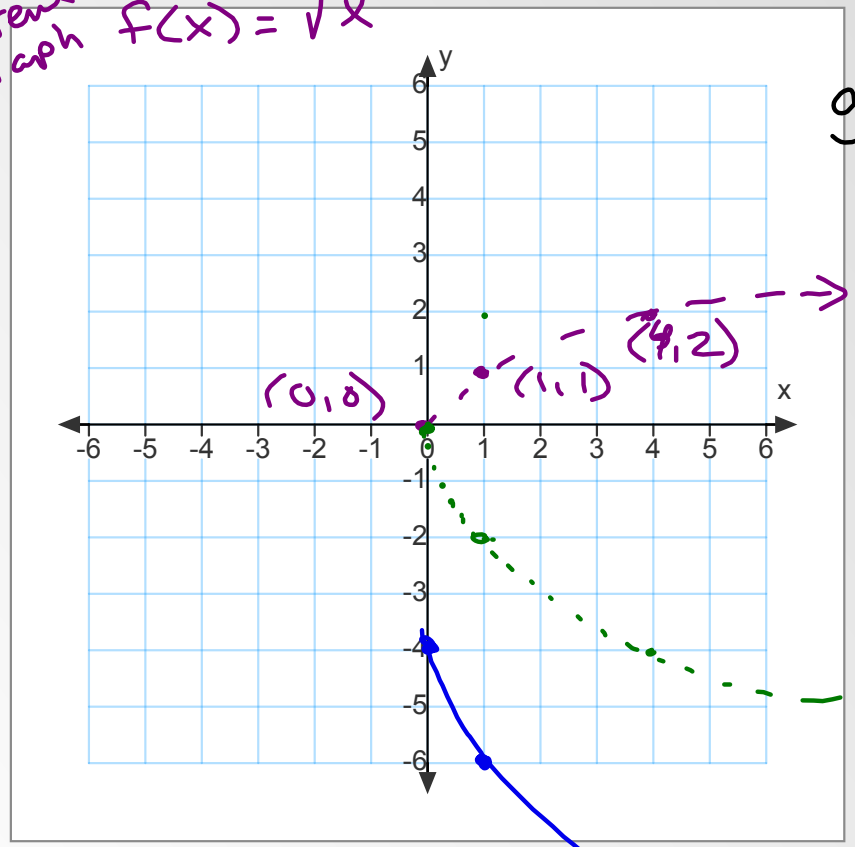
c f(x) stretches/shrinks **vertically**

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

f(c x) stretches/shrinks **horizontally**

Ex 2 $g(x) = -2\sqrt{x} - 4$

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



down 4

$g(x) = -2\sqrt{x} - 4$

↑ stretches vertically

flip over x-axis

$-2\sqrt{x}$

$g(x) = 2\sqrt{x} - 4$

$g(x) = -|2x + 6| - 1$

$-|2(x+3)| - 1$

left 3, down 1

$g(x) = -|2(x+3)| - 1$

↑ shrinks ↔ horizontally by factor of 2.

↑ flips over x-axis