Domain:

$y = f(x)$

$x \longmapsto y$

$\mathcal{D} = \{x \mid y = f(x) \text{ is defined}\}$ = Domain

$\mathcal{R} = \{y \mid y = f(x) \text{ exists for some } x \in \mathcal{D}(f)\}$ = Range

2 things:

① $\sqrt{\text{negative}}$

② $\frac{\text{Number}}{0}$

$\sqrt{\text{STUFF}}$ Need stuff ≥ 0

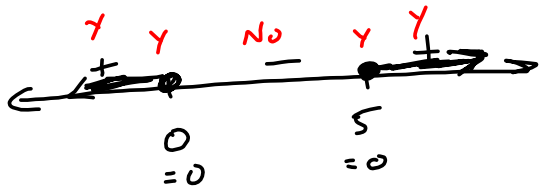
$\frac{\text{ANYTHING}}{\text{STUFF}}$ Need stuff $\neq 0$

Combo: $\frac{\text{☺}}{\sqrt{\text{stuff}}}$ Need stuff ≥ 0 & $\sqrt{\text{stuff}} \neq 0$ } stuff > 0.

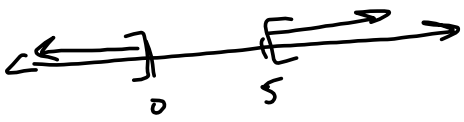
$\mathcal{D}(f)$:

$f(x) = \sqrt{x^2 - 5x}$ Need: $x^2 - 5x \geq 0$

$x(x-5) \geq 0$



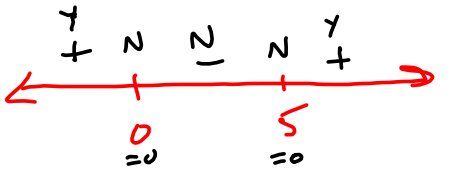
$= (-\infty, 0] \cup [5, \infty)$



$g(x) = \dfrac{5x^2-27x+11}{\sqrt{x^2-5x}}$ $\longrightarrow$ Need $x^2-5x \geq 0$ & $\sqrt{x^2-5x} \neq 0$

$\Rightarrow x^2-5x \neq 0$

$x^2-5x > 0$



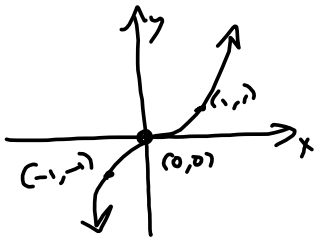
$= (-\infty, 0) \cup (5, \infty)$

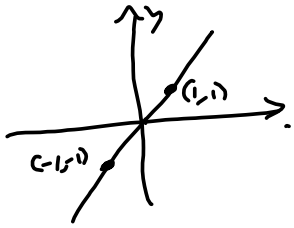
Test Values:

$(-\infty, 0)$	-1	$-1(-1-5)$	$+$
$(0, 5)$	1	$1(1-5)$	$-$
$(5, \infty)$	6	$6(6-5)$	$+$

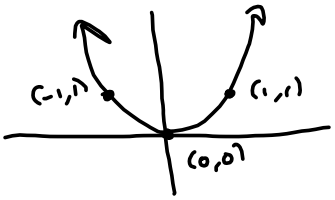
Basic functions

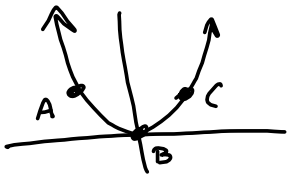
$x, x^3, x^5, x^7, \ldots$





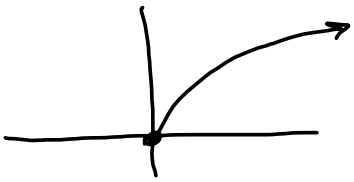
$x^2, x^4, x^6, x^8, \ldots$

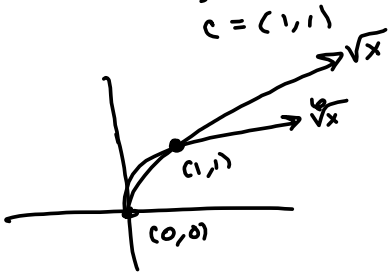




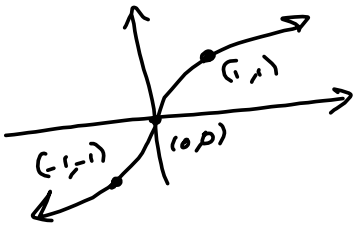
$A = (-1,1)$
$B = (0,0)$
$C = (1,1)$

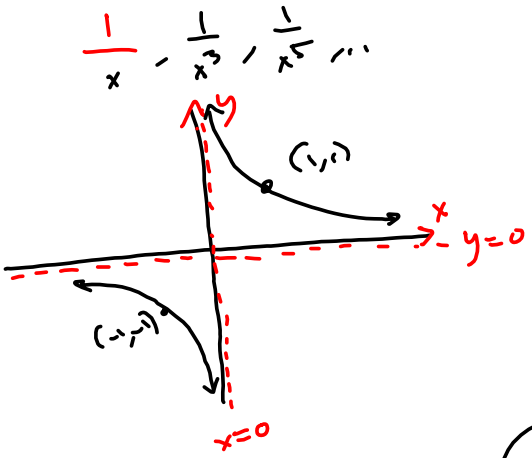
$\sqrt{x}, \sqrt[4]{x}, \sqrt[6]{x}, \ldots$

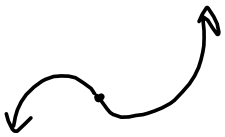


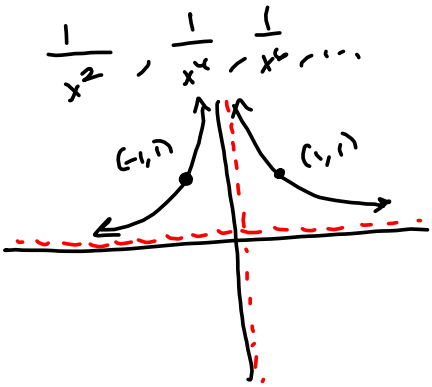


$\sqrt[3]{x}, \sqrt[5]{x}, \ldots$




1/x , 1/x^3 , 1/x^5 ...
y
x
(1,1)
(-1,-1)
y=0
x=0

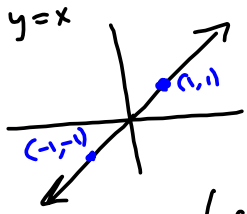


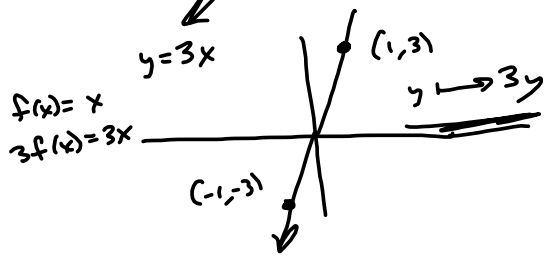

1/x^2 , 1/x^4 , 1/x^6 ...
(-1,1)
(1,1)

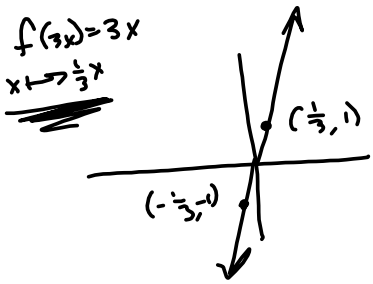
$af(x)$

$(x,y) \longmapsto (x, ay)$

$f(bx) \quad (x,y) \longmapsto (\frac{1}{b}x, y)$



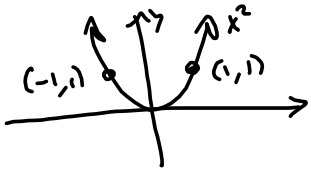


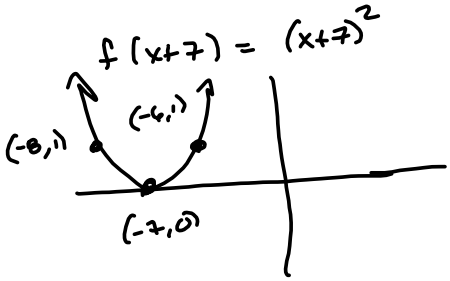


$f(x+c)$

$(x,y) \longmapsto (x-c, y)$

$f(x)=x^2$



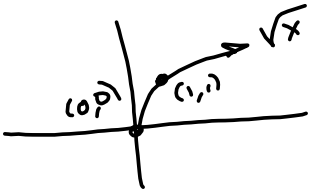


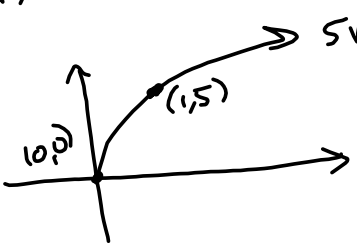
$f(x)+d$

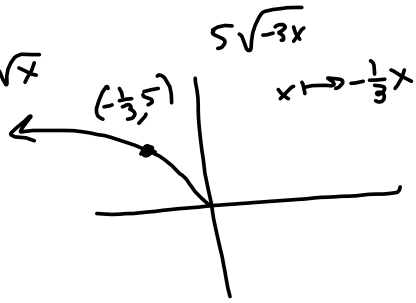
$(x,y) \longmapsto (x, y+d)$

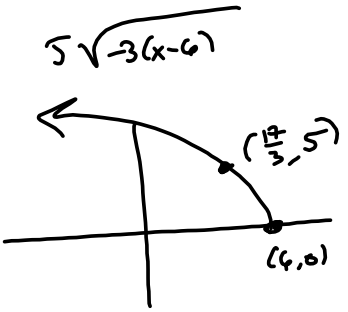
$g(x) = 5\sqrt{-3x+18} + 7 = 5\sqrt{-3(x-6)} + 7$

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

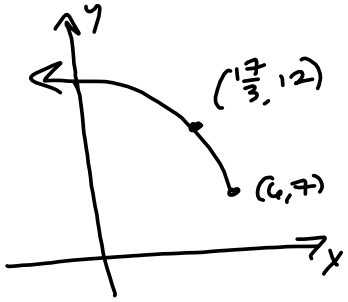








$-\frac{1}{3} + \frac{6}{1} \cdot \frac{3}{3} = \frac{-1+18}{3}$



$D = (-\infty, 6]$

$R = [7, \infty)$

$x^3 - y^3 = (x-y)(x^2+xy+y^2)$

$x^3 + y^3 = (x+y)(x^2-xy+y^2)$

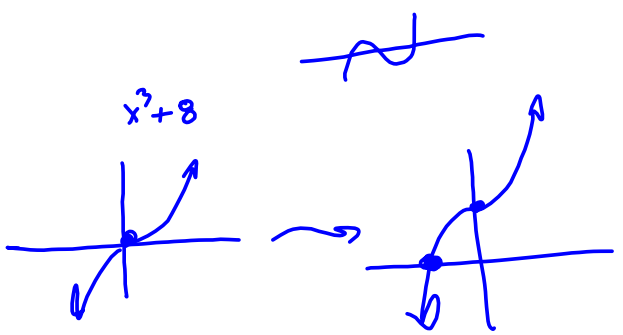
Domain of $\frac{x+2}{x^3+8} = \frac{x+2}{(x+2)(x^2-2x+4)} = \frac{1}{x^2-2x+4}$

↳ is this ever zero?

$x \neq -2$

$\mathcal{D} = \mathbb{R} \setminus \{-2\}$

$= (-\infty, -2) \cup (-2, \infty)$



$x^2-2x+4 = x^2-2x+1^2-1+4 = (x-1)^2+3$