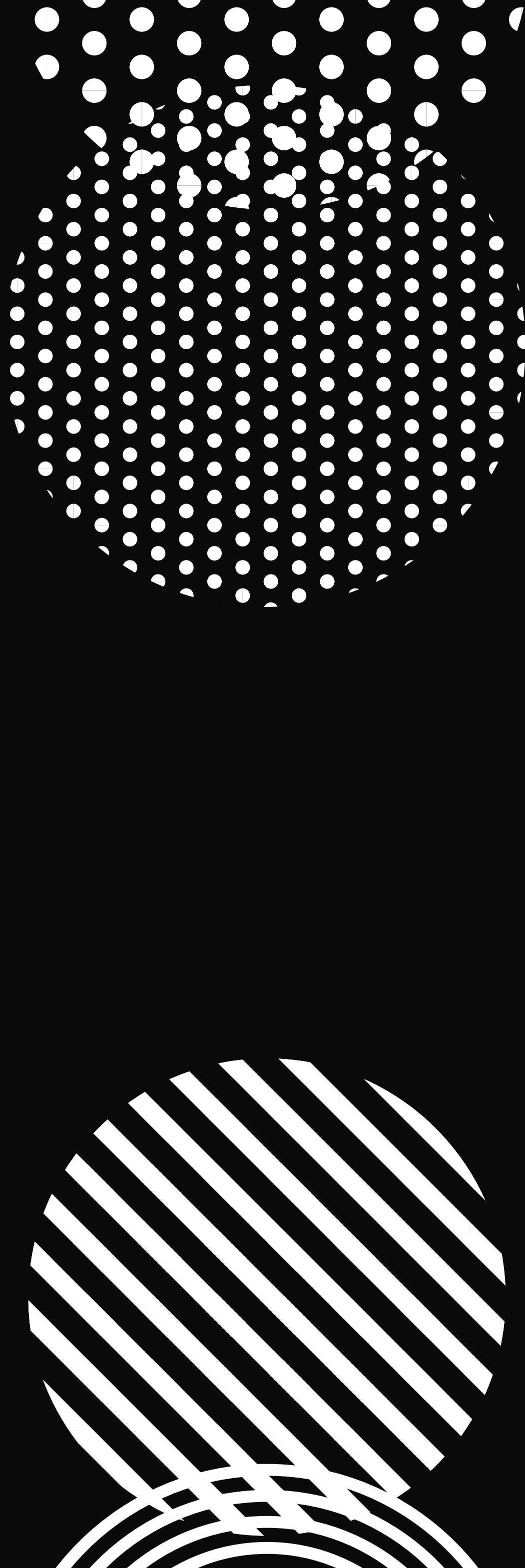


$f(x) = \sqrt{2\sin(x)+1}$

$\mathrm{Dom}(f) = ?$

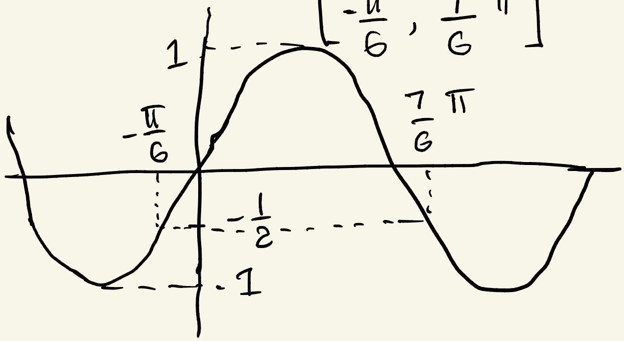
sin - cos - 2π period

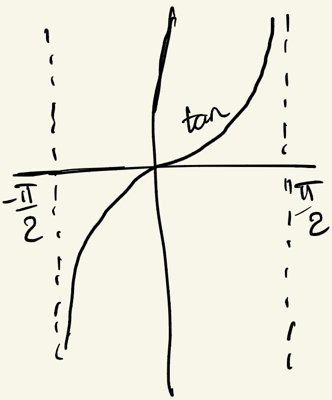
tan - cot - π period

$2\sin x + 1 \geq 0$

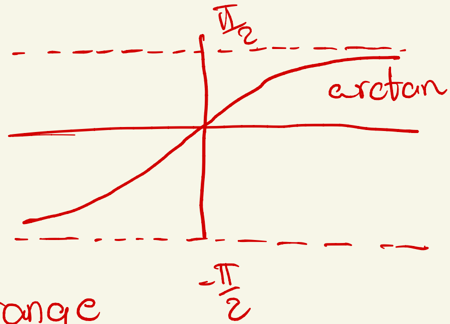
$\sin x \geq -\frac{1}{2}$

$\left[-\frac{\pi}{6}, \frac{7}{6}\pi\right]$





f^{-1} arctan



domain $= \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ = range

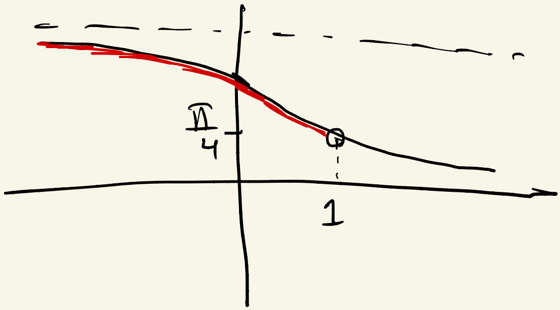
range $= (-\infty, +\infty)$ = domain

$\arctan x = \frac{3}{2}\pi$

No sol^n: - just values approaching $\frac{3}{2}\pi$.

$\operatorname{arccot} x > \frac{\pi}{4}$

$x \in (-\infty, 1)$



$\cot x = \frac{\cos x}{\sin x}$

$\cot \frac{\pi}{4} = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$

$\operatorname{arccot} x > \frac{\pi}{4}$

$x < 1$

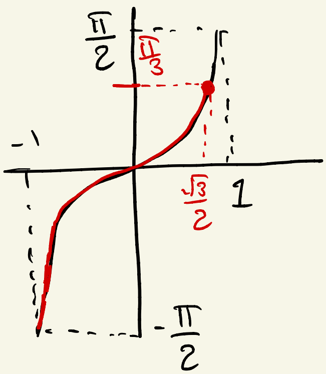
cot - decreasing function

$A < B$

$-A > -B$

$\sin \Big|_{[-\frac{\pi}{2}, \frac{\pi}{2}]}$

$\arcsin x$

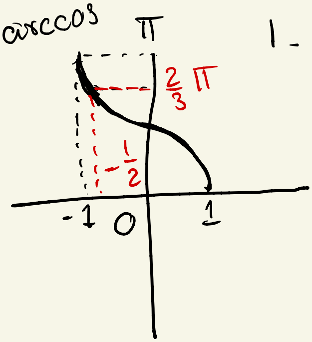


$\arcsin x \leq \frac{\pi}{3}$

$x \in [-1, \frac{\sqrt{3}}{2}]$

$\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$

$\arccos(1-x) = \frac{2}{3}\pi$



$1 - x = -\frac{1}{2}$

$x = \frac{3}{2}$

sign fun

$$\mathrm{sgn}(x) = \begin{cases} 1, & x > 0 \\ 0, & x = 0 \\ -1, & x < 0 \end{cases}$$

Quadratic fun:

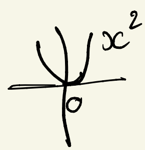
$f(x) = ax^2 + bx + c$

$a < 0$, downward concave

$a > 0$, upward "

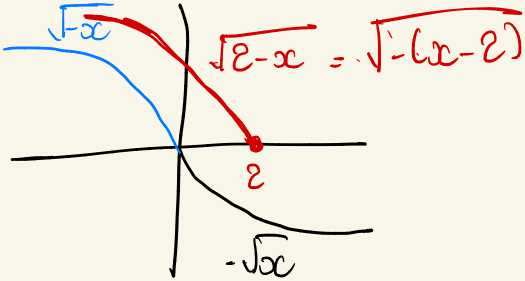
vertex $= -\dfrac{b}{2a}$

$(x - a)^2 + b$



$a \rightarrow$ right shifts on x-axis

$b \rightarrow$ up shifts on y-axis

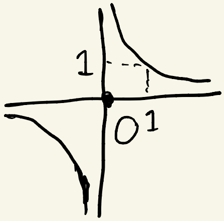


$f(x) = x^2$

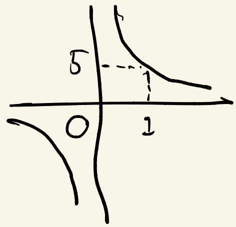
injective from $[0, +\infty)$

Linear Rational Functions

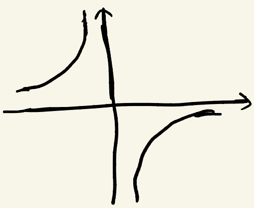
$\dfrac{1}{x}$



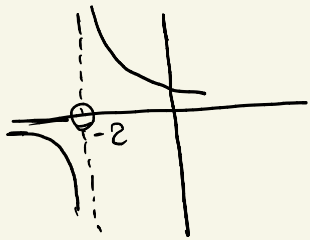
$\dfrac{5}{x}$



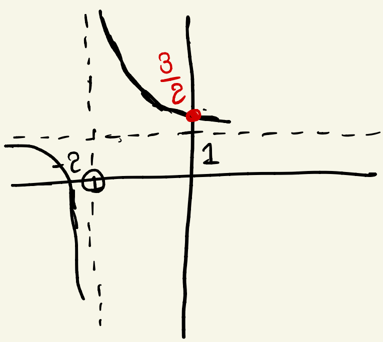
$-\dfrac{1}{x}$



$\dfrac{1}{x+2}$



$\dfrac{1}{x+2} + 1$

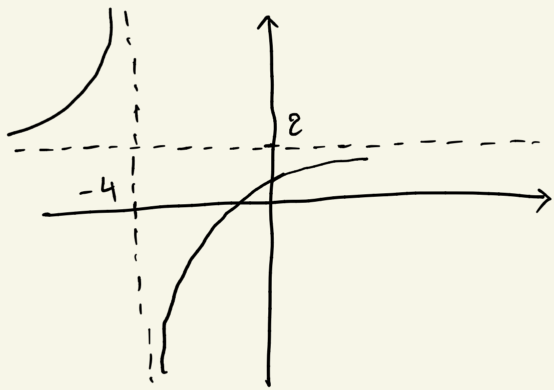


$$\frac{x+3}{x+2} = \frac{x+2}{x+2} + \frac{1}{x+2}$$

$$= \frac{1}{x+2} + 1$$

$$\frac{2x+3}{x+4} = \frac{2(x+4)}{x+4} - \frac{5}{x+4}$$

$$= 2 - \frac{5}{x+4}$$



Exponential Functions

$f: R \to R$

$f(x) = a^x$

$a \in (0, +\infty)$

$1^{+\infty} \neq 1$

$1^x = 1$

$2^\infty = \infty$

if $a \in (0,1)$, approaches 0, for a^∞.

$\left(\frac{1}{3}\right)^x - \sqrt{3} > 0$

$3^{-x} - 3^{\frac{1}{2}} > 0$

$3^{-x} > 3^{\frac{1}{2}}$

$\log_3 3^{-x} > \log_3 3^{\frac{1}{2}}$

$-x > \frac{1}{2}$

$x < -\frac{1}{2}$

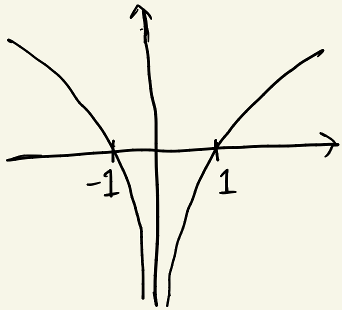
$\left(\frac{1}{3}\right)^x > \left(\frac{1}{3}\right)^{-\frac{1}{2}}$

$\log_{\frac{1}{3}} \left(\frac{1}{3}\right)^x > \log_{\frac{1}{3}} \left(\frac{1}{3}\right)^{-\frac{1}{2}}$

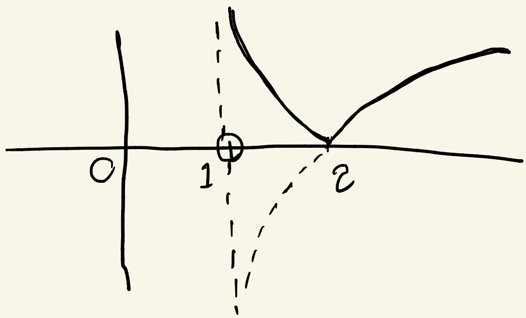
$x < -\frac{1}{2}$

$\log_{\frac{1}{3}} x$ is a decreasing function.

$\log x^2$, domain $= \mathbb{R} \setminus \{0\}$



$\log_{10} |(x-1)|$, domain $= (1, +\infty)$



Neighbourhood of $+\infty = (\alpha, +\infty)$

alpha