Section 1.6 cofunctions (and tangent)

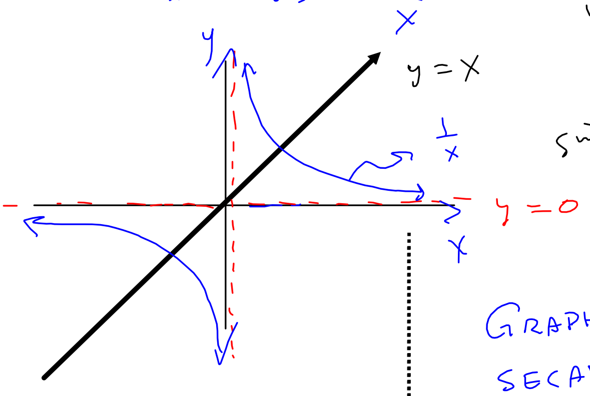
Section 1.7 Inverse Trig Functions

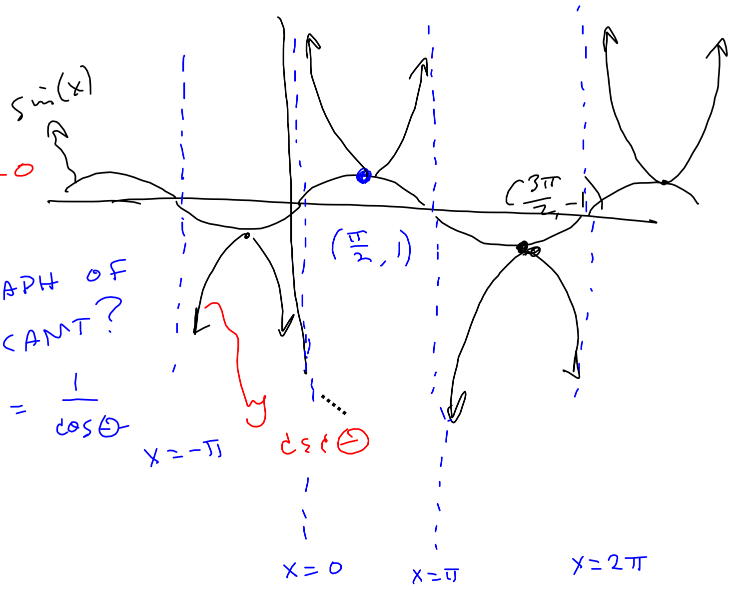
Section 1.5 Questions?

§1.6 Recall $\csc\theta = \dfrac{1}{\sin\theta}$

x -vs- $\dfrac{1}{x}$

$y = \csc\theta$





GRAPH OF SECANT?

$\sec\theta = \dfrac{1}{\cos\theta}$

Asymptotes: $x = n\pi,\ n \in \mathbb{Z}$

$(-\infty, 3) \cup (3, 5) \cup (5, \infty)$

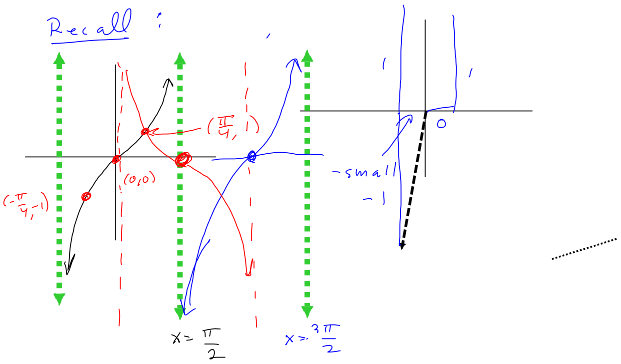
$= \mathbb{R} \setminus \{3, 5\}$

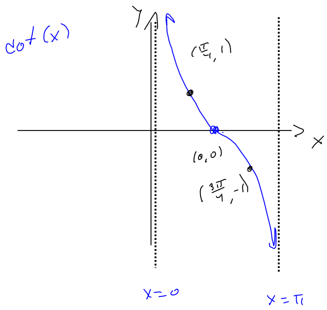
$\text{Domain} = \{x \mid f(x) \in \mathbb{R}\}$

$= \{x \mid x \neq n\pi,\ n \in \mathbb{Z}\}$

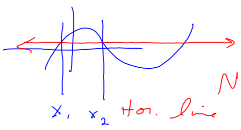
$= \mathbb{R} \setminus \{n\pi \mid n \in \mathbb{Z}\}$

Recall :





Recall 1-to-1 function
Horizontal line test



$y = y_1 = f(x_1) = f(x_2)$

Not 1-to-1

Hor. line hits it more than once.

Def'n $x_1 \neq x_2 \Rightarrow f(x_1) \neq f(x_2)$
iff
$f(x_1) = f(x_2) \Rightarrow x_1 = x_2$

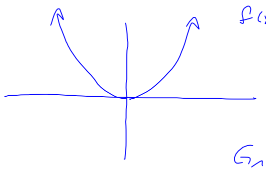
Why's this important?

We want to reason back/reclaim the x-value corresponding to a given f(x) value.

If this isn't unique, then going from y back to x is not well-defined as a function.

$\boxed{E}$ $f(x) = x^2 \Rightarrow f^{-1}(x) = \sqrt{x}$

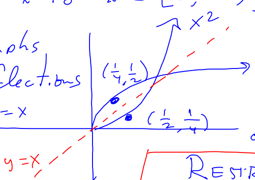
Almost



$f(x) = x^2$ is NOT 1-to-1

BUT if we restrict x to $x \in [0, \infty)$, then

Graphs are reflections across $y = x$



$y = \sqrt{x}$
$= f^{-1}(x)$
on the RESTRICTED DOMAIN.

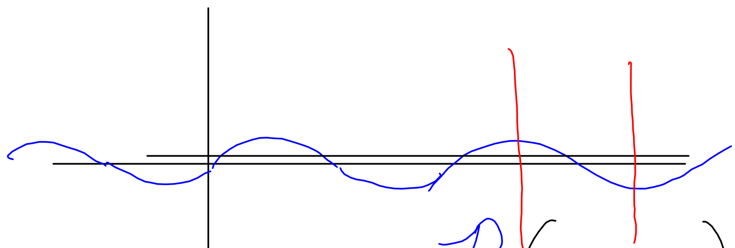
We restrict the domains of TRIG FUNCTIONS, so that the $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$ keys actually are function keys

Feb 7-8:30 AM

sine & arc sine

$\sin^{-1}(x)$ BAD

$\text{Arcsin}(x)$ GOOD



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

$\mathcal{R}(\text{arcsine}) = [-\frac{\pi}{2}, \frac{\pi}{2}]$

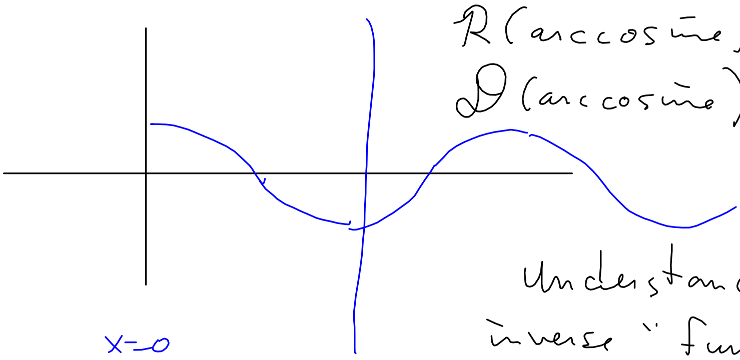
$\mathcal{D}(\text{arcsine}) = [-1, 1]$

Include end points (NOT Major deal)

How about inverse cosine?

$\mathcal{R}(\text{arccosine}) = [0, \pi]$

$\mathcal{D}(\text{arccosine}) = [-1, +1]$



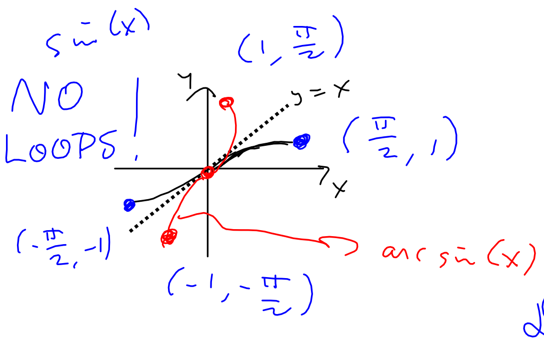
$x = 0$ $x = \pi$

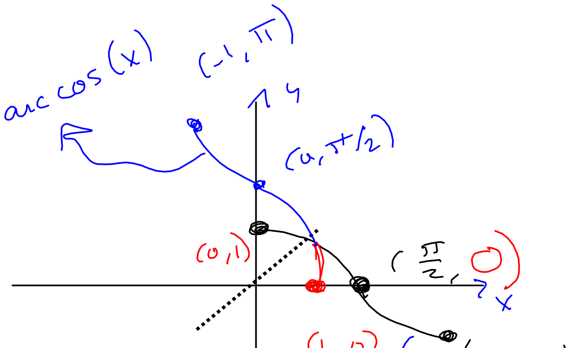
Understand that these inverse "functions" only see a very small piece.

YOU SUPPLY THE REST!

Graphs of arcsine & arccosine & arctangent.

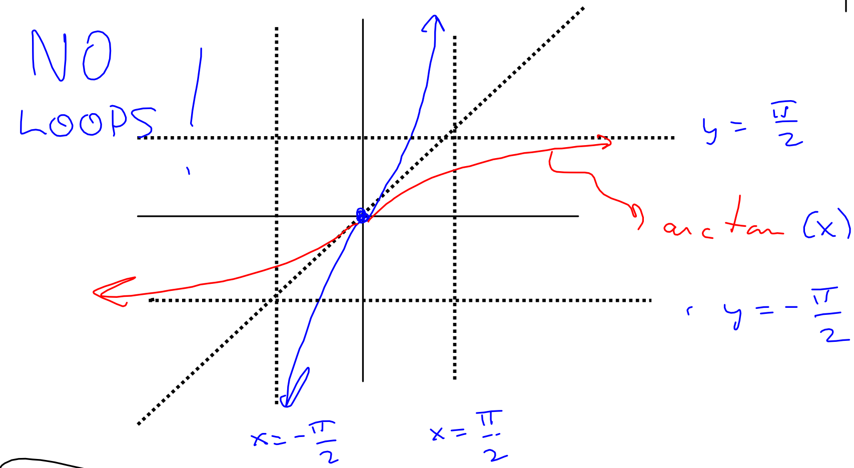
sketch arcsine

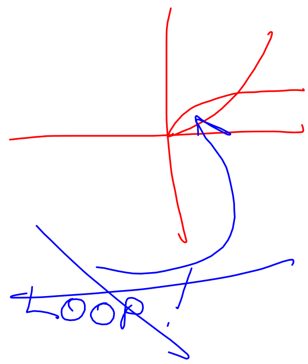




$\mathcal{D}$(arccosine) = $[-1, 1]$

$\mathcal{R}$(arccosine) = $[0, \pi]$





$\mathcal{D}$(arctangent) = $\mathcal{R}$(restricted tangent) = $(-\infty, \infty)$

$\mathcal{R}$(arctan) = $\mathcal{D}$(restricted tangent) = $(-\frac{\pi}{2}, \frac{\pi}{2})$