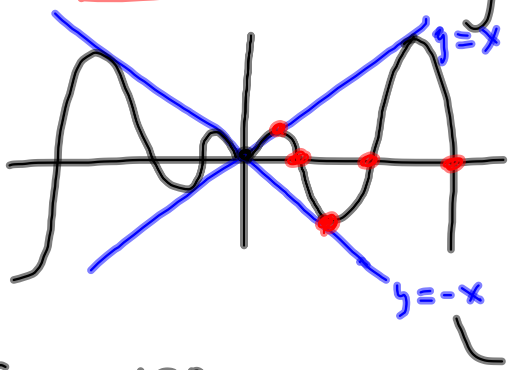
~~Remind me Friday~~: "Damped" graphs



$f(x) = x \sin x$ OR

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

$\sin x$ oscillates between

$y = +1$ & $y = -1$.

when $\sin x = 1$, then

$x \sin x = x$

See pg 190

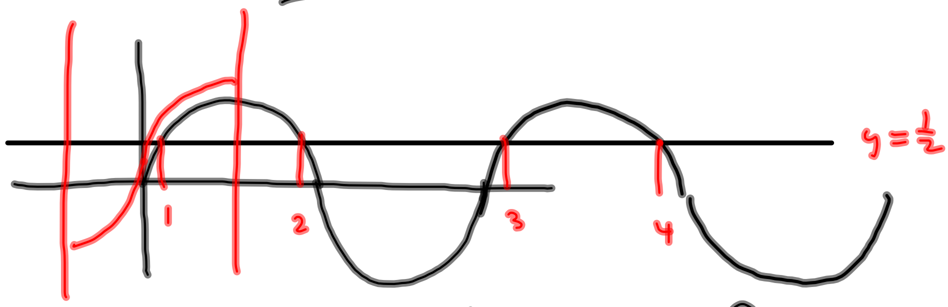
Own 'em!

Graphing Utility:

http://www.meta-calculator.com/online/

Inverse Trig Functions

Sine is NOT 1-to-1



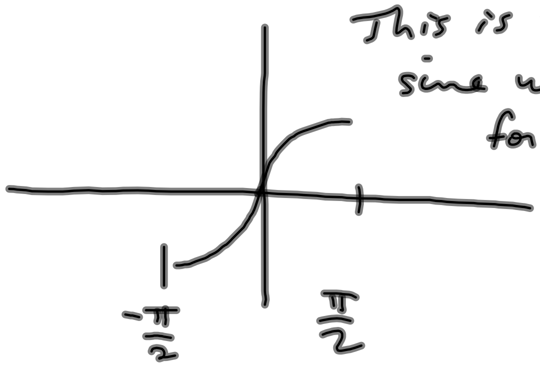
So the equation $\sin x = \frac{1}{2}$ has an infinite number of solutions.

Your calculator has an "arcsine" or $\sin^{-1}$

We want arcsine to be a function:

$\arcsin(\frac{1}{2})$ **HAS** just one output!

"angle whose sine is $\frac{1}{2}$" is ~~the~~ a solution of the equation $\sin(x) = \frac{1}{2}$



This is the ~~pce~~ piece of sine where we're looking for $\theta = \arcsin(x)$ to come from.

When you hit $\sin^{-1}(x)$ on your calculator, the result is ALWAYS between $-\frac{\pi}{2}$ & $\frac{\pi}{2}$

$-90°$ & $90°$

$$\sin(3x+2) = \frac{1}{2}$$

Ahead of ourselves.

$$3x+2 = \arcsin\left(\frac{1}{2}\right) = \frac{\pi}{6}$$

$$3x+2 = \frac{\pi}{6}$$

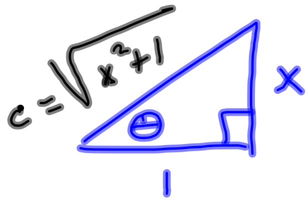
This only captures the angle in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ that satisfies $\sin(3x+2) = \frac{1}{2}$

$\sin(\arctan(x))$

"Sine of the angle whose tangent is x."

$x^2+1^2=c^2$

$\sqrt{x^2+1}=c$



CALC II!

we want the sine of θ.

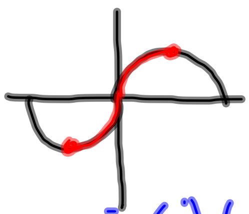
$$\sin(\underbrace{\arctan(x)}_{\theta}) = \frac{x}{\sqrt{x^2+1}}$$

Ranges of the inverse trig functions are found by an appropriate restriction on the domains of the trig functions

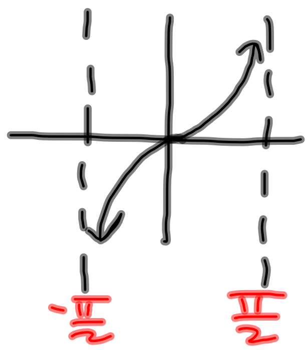
$\cos(x)$

$\arccos(\theta)$ has $\mathcal{R}=[0,\pi]$

$\sin(x)$



$\arcsin(\theta)$ has $\mathcal{R}=[-\frac{\pi}{2},\frac{\pi}{2}]$



$\arctan(\theta)$ has $\mathcal{R}=(-\frac{\pi}{2},\frac{\pi}{2})$