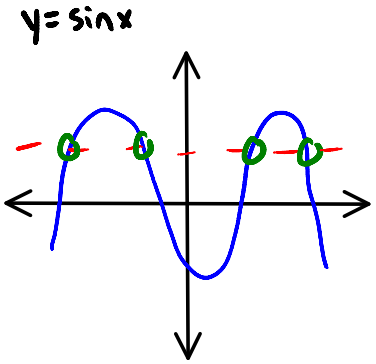
4.7 Inverse Trig Functions

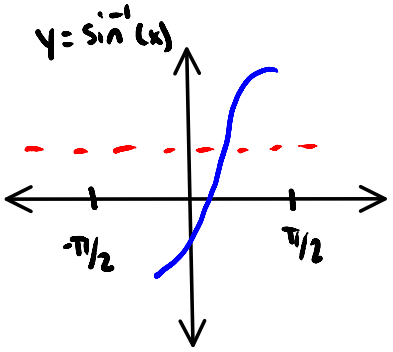
Wednesday, April 01, 2015
11:01 AM

For a function to have an **Inverse** that is a function, the **Original** function must pass the HORIZONTAL LINE TEST!

ALL TRIG FUNCTIONS FAIL THE HLT!



Fails HLT



Passes HLT

With trig functions, you must restrict the domain so that you have **inverse trig functions**.

Defn. of Inverse Sine Function

$y = \arcsin x$ or $y = \sin^{-1} x$

The inverse of sine is defined if and only if $\sin y = x$; where $-1 \le x \le 1$

$-\frac{\pi}{2} \le y \le \pi/2$

x and y switch places for inverses!

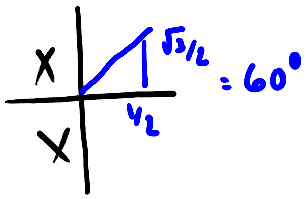
* LOOK AT HANDOUT OF INVERSE GRAPHS *

Notice that the x- and y-axis switch for the inverse.

$\sin \pi = 1$ $\sin^{-1}(1) = \pi$

$\sin \frac{\pi}{6} = \frac{1}{2}$ $\quad \sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$

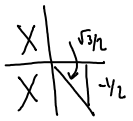
$\sin\theta = \frac{\sqrt{3}}{2} \longrightarrow \arcsin\frac{\sqrt{3}}{2} = \theta \quad \theta = \frac{\pi}{3}$

$\sin: \frac{y}{1}$ 

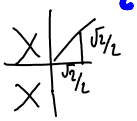
* for the restriction $-\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$, inverse sine has to be in the 1st or 4th quadrant.

Ex. 1 Find the exact value.

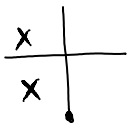
a) $\arcsin(-1/2)$

$\sin\frac{y}{1} = \frac{-1/2}{1}$ 

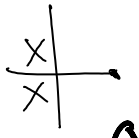
$\theta = -\frac{\pi}{6}$

b) $\sin^{-1}\frac{\sqrt{2}}{2}$ 

$\theta = \frac{\pi}{4}$

c) $\sin^{-1}(-1)$ 

$\theta = -\pi/2$

d) $\arcsin(0)$ 

$\theta = 0$ rads

Defn of Other Trig functions

$y = \arccos x$ $\quad (y = \cos^{-1} x)$ if and only if $\cos y = x$ $\quad$ Domain $-1 \le x \le 1$, Range $0 \le y \le \pi$

* To find the inverse of cosine, use quad I and II. $\quad \arccos$ 

$y = \arctan x$ $\quad (y = \tan^{-1} x)$ if and only if $\tan y = x$ $\quad$ Domain $-\infty < x < \infty$, Range $-\pi/2 < y < \pi/2$

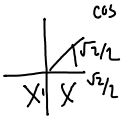
To find the inverse of tangent, use .

To find the inverse of tangent, use quad. I or IV.

arc tan 

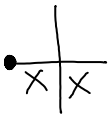
Ex. 2 Find the exact value

a) arc cos $\frac{\sqrt{2}}{2}$



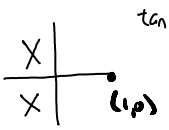
$\theta = \frac{\pi}{4}$

b) $\cos^{-1}(-1)$



$\theta = \pi$

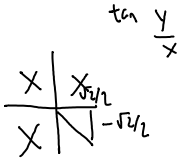
c) arc tan (0)



0°

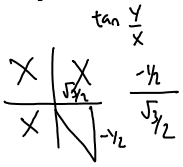
$\theta = 0$ rad

d) $\tan^{-1}(-1)$



$\theta = -\frac{\pi}{4}$

e) $\tan^{-1}(-\sqrt{3}/3)$



$\theta = -\frac{\pi}{6}$

f) arc tan $(\sqrt{3})$