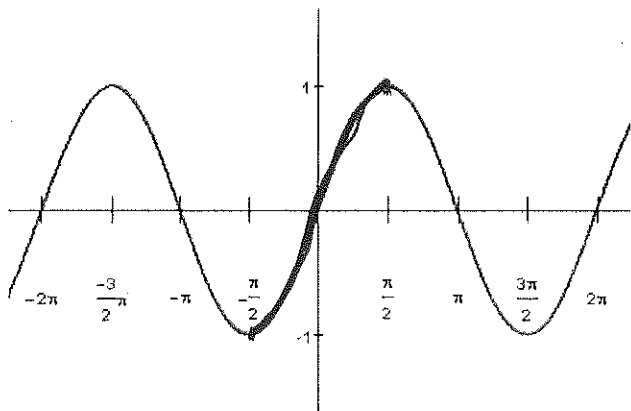


4.7 – Inverse Trig Functions (Day 1)

Sine Function



$y = \sin(x)$ IS a function

How do you know?

Passes Vertical Line Test

The INVERSE of $y = \sin(x)$ is NOT a function

How do you know?

Does not pass horizontal Line Test
(\therefore doesn't have an inverse)

Even though the inverse of $y = \sin(x)$ is not a function, we study the inverse anyway, but only look at a small portion of the graph.

We restrict the domain to $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

On this interval...

1) $y = \sin(x)$ is increasing or decreasing? increasing

2) What is the domain? $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ $[-\frac{\pi}{2}, \frac{\pi}{2}]$

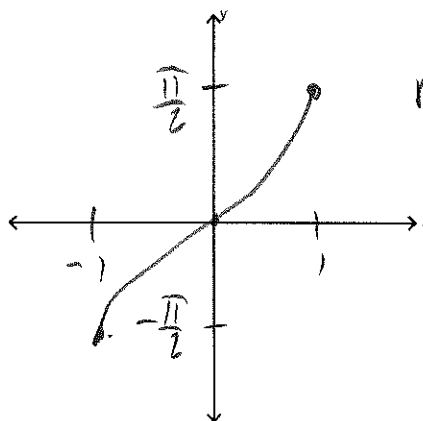
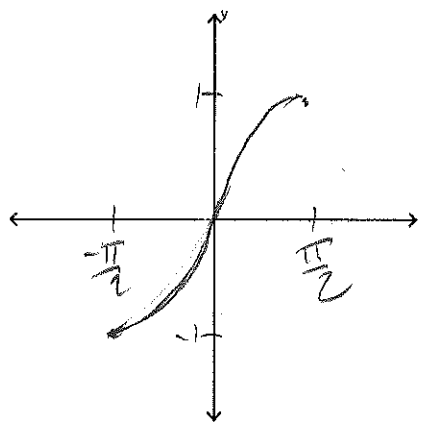
3) What is the range? $-1 \leq y \leq 1$ $[-1, 1]$

So when we graph the inverse function,

1) will it be increasing or decreasing? \uparrow

2) What is the domain? $-1 \leq x \leq 1$ $[-1, 1]$

3) What is the range? $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$ $[-\frac{\pi}{2}, \frac{\pi}{2}]$



reflection over $y = x$

4.7 – Inverse Trig Functions (Day 1)

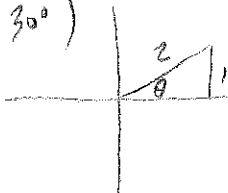
We use two types of notation for inverse functions:

$Y = \arcsin X$ or $Y = \sin^{-1} X$


The idea behind the inverse problems is that they are GIVING you the value of the function, and you are trying to find the angle measure (in degrees or radians)

Example 1) Find the EXACT value (you are looking for ANGLE measures)
(hint: it may help to draw a right triangle)

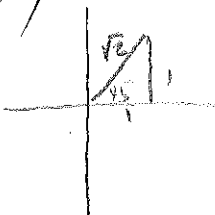
a) $\sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6} \text{ (} 30^\circ \text{)}$




b) $\arcsin\left(\frac{-\sqrt{3}}{2}\right) = -\frac{\pi}{6} \text{ (} -60^\circ \text{)}$




c) $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4} \text{ (} 45^\circ \text{)}$



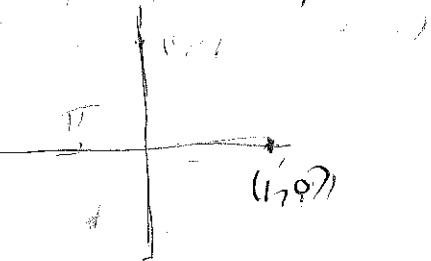
d) $\arcsin(-2) = \text{undefined}$ (Domain is $[-1, 1]$)



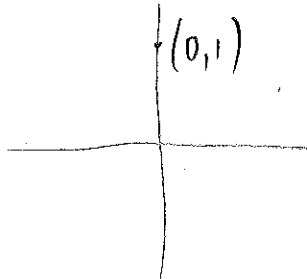
e) $\sin^{-1}\left(\frac{-1}{2}\right) = -\frac{\pi}{6} \text{ (} -30^\circ \text{)}$



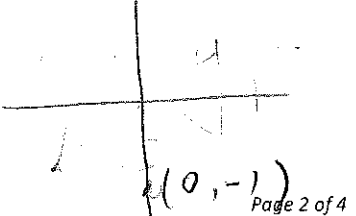
f) $\arcsin(0) = 0$



g) $\sin^{-1}(1) = \frac{\pi}{2}$

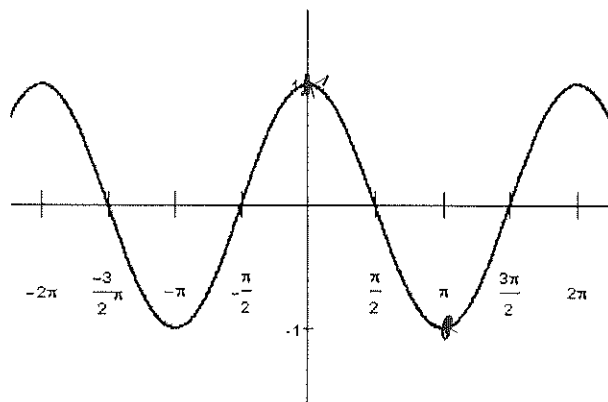


h) $\arcsin(-1) = -\frac{\pi}{2}$



4.7 – Inverse Trig Functions (Day 1)

Cosine Function



Domain: $[0, \pi]$

Range: $[-1, 1]$

So for the inverse,

domain: $[-1, 1]$

range: $[0, \pi]$

Example 2) Find the exact value

a) $\arccos\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$ (30°)

b) $\cos^{-1}\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$ (45°)

c) $\arccos(1) = 0$

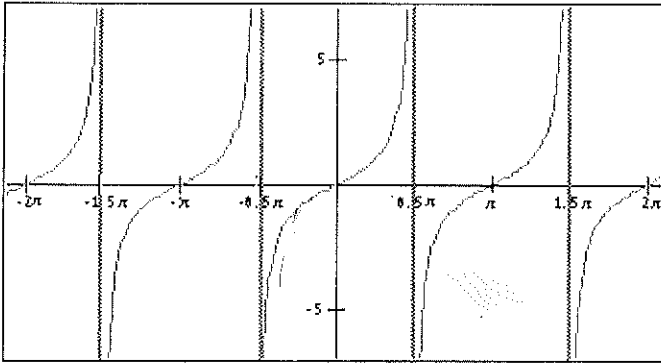
d) $\cos^{-1}(0) = \frac{\pi}{2}$

e) $\cos^{-1}\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$ (120°)

f) $\arccos(-1) = \pi$

4.7 – Inverse Trig Functions (Day 1)

Tangent Function



Domain: $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Range: $(-\infty, \infty)$

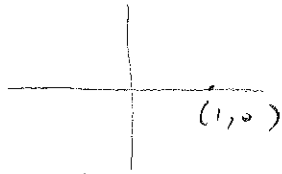
So for the inverse,

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

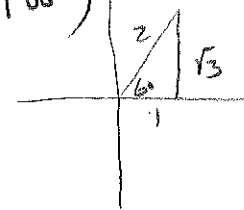
Example 3) Find the exact value

a) $\arctan(0) = 0$

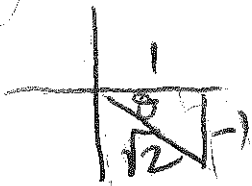
$\frac{\sin}{\cos} = 0 \Rightarrow \sin = 0$



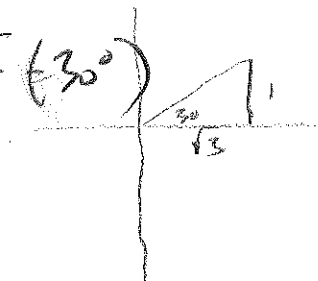
b) $\tan^{-1}(\sqrt{3}) = \frac{\pi}{3} (60^\circ)$



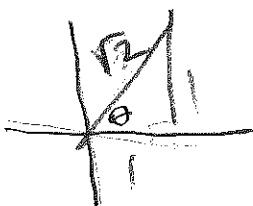
c) $\arctan(-1) = -\frac{\pi}{4} (-45^\circ)$



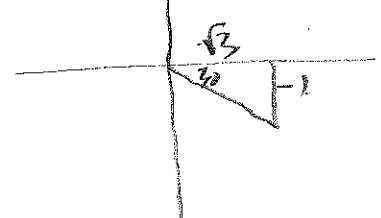
d) $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right) = \frac{\pi}{6} (30^\circ)$



e) $\arctan(1) = \frac{\pi}{4} (45^\circ)$



f) $\tan^{-1}\left(\frac{-\sqrt{3}}{3}\right) = -\frac{\pi}{6} (-30^\circ)$



Homework for Day 1: p.349 # 1-16