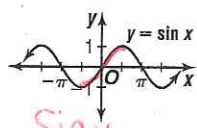
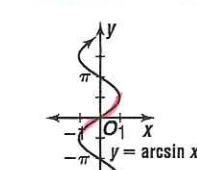
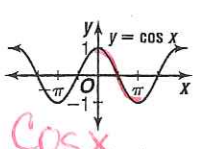
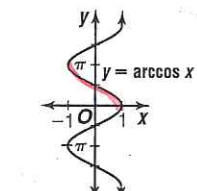
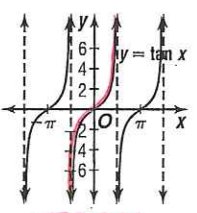
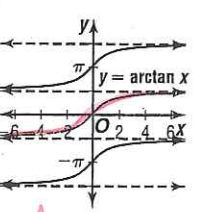


An **inverse** of a function may be found by interchanging the coordinates of the ordered pairs of a function

The **domain** of the function becomes the Range

The **range** of the function becomes the Domain

Is an inverse of a function always a function? NO

Relation	Ordered Pairs	Graph	Domain	Range
$y = \sin x$	$(x, \sin x)$	 A coordinate plane showing the sine wave $y = \sin x$. The x-axis is labeled with $-\pi, 0, \pi$ and the y-axis with $-1, 1$. The graph passes through the origin and has a period of 2π . Handwritten in red below the graph is "Sin x".	All real numbers $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$	$-1 \leq y \leq 1$
$y = \arcsin x$	$(\sin x, x)$	 A coordinate plane showing the arcsine function $y = \arcsin x$. The graph is a curve passing through the origin, bounded between $x = -1$ and $x = 1$. Handwritten in red below the graph is "ARCSIN x".	$-1 \leq x \leq 1$	All real numbers $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$
$y = \cos x$	$(x, \cos x)$	 A coordinate plane showing the cosine wave $y = \cos x$. The x-axis is labeled with $-\pi, 0, \pi$ and the y-axis with $-1, 1$. The graph has a period of 2π and a y-intercept at $(0, 1)$. Handwritten in red below the graph is "Cos x".	All real numbers $0 \leq x \leq \pi$	$-1 \leq y \leq 1$
$y = \arccos x$	$(\cos x, x)$	 A coordinate plane showing the arccosine function $y = \arccos x$. The graph is a curve passing through $(0, \frac{\pi}{2})$, bounded between $x = -1$ and $x = 1$. Handwritten in red below the graph is "ARCCOS x".	$-1 \leq x \leq 1$	All real numbers $0 \leq y \leq \pi$
$y = \tan x$	$(x, \tan x)$	 A coordinate plane showing the tangent function $y = \tan x$. The graph consists of multiple branches separated by vertical asymptotes at $x = \pm\frac{\pi}{2}$. Handwritten in red below the graph is "Tan x".	All real numbers except $\frac{\pi}{2}n$, where n is an odd integer $-\frac{\pi}{2} < x < \frac{\pi}{2}$	All real numbers
$y = \arctan x$	$(\tan x, x)$	 A coordinate plane showing the arctangent function $y = \arctan x$. The graph is a curve passing through the origin, bounded between horizontal asymptotes at $y = \pm\frac{\pi}{2}$. Handwritten in red below the graph is "ARCTAN x".	All real numbers	All real numbers except $\frac{\pi}{2}n$, where n is an odd integer

Are any of the inverses above functions?

NO

$-\frac{\pi}{2} < y < \frac{\pi}{2}$

6-8 Trigonometric Inverses and Their Graphs

We can make these functions by considering only a part of the domain.

Function	Domain	Range
$y = \sin x$	$-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$	$-1 \leq y \leq 1$
$y = \arcsin x$	$-1 \leq x \leq 1$	$-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$
$y = \cos x$	$0 \leq x \leq \pi$	$-1 \leq y \leq 1$
$y = \arccos x$	$-1 \leq x \leq 1$	$0 \leq y \leq \pi$
$y = \tan x$	$-\frac{\pi}{2} < x < \frac{\pi}{2}$	all real numbers
$y = \arctan x$	all real numbers	$-\frac{\pi}{2} < y < \frac{\pi}{2}$

The values in the domain are called principal values.

(These make it a function)

* show red on other side

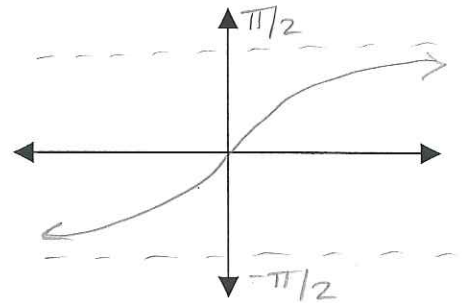
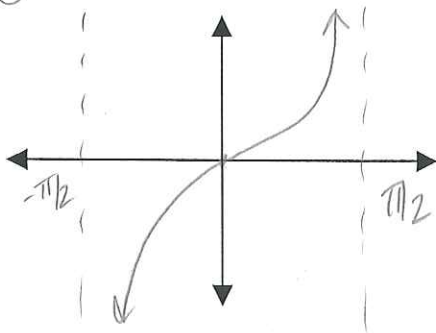
Ex: Write the equation for the inverse of $y = \arctan \frac{1}{2}x$. Then graph the function and its inverse

$y = 2 \tan x$

$x = \arctan \frac{1}{2}y$

$\tan x = \frac{1}{2}y$

$2 \tan x = y$



Ex: Find each value. * Look at Domain & Range values

a. $\arcsin -\frac{1}{2}$ what angle has sine $-\frac{1}{2}$?

$\sin \theta = -\frac{1}{2}$

$\theta = \boxed{-\pi/6}$

b. $\tan^{-1}(\sin \frac{\pi}{2})$

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

$\boxed{\pi/4}$

c. $\cos(\arctan \sqrt{3} - \arcsin \frac{\sqrt{3}}{2})$

$\cos(\frac{\pi}{3} - \frac{\pi}{3})$

$\cos(0) = \boxed{1}$

d. $\tan[\tan^{-1}(\sqrt{3}) + \frac{\pi}{3}]$

$\tan[\frac{\pi}{3} + \frac{\pi}{3}]$

$\tan[\frac{2\pi}{3}]$

$\boxed{-\sqrt{3}}$

$\tan \theta = \sqrt{3}$

Ex: Determine whether $\sin^{-1}(\sin x) = x$ is true or false for all values of x. If false, give a counterexample.

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

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

$\sin^{-1}(\frac{\sqrt{3}}{2}) = \frac{\pi}{3} \neq x$

False