WARM UP

1. If $h(x) = \cos x + 3x$, find a) $h(0)$ and b) $(h^{-1})'(1)$.

2. Evaluate arcsin(- 1/2)

3. Find the slope of the normal line to
$x^2 + y^2 = 100$ at (6,8).

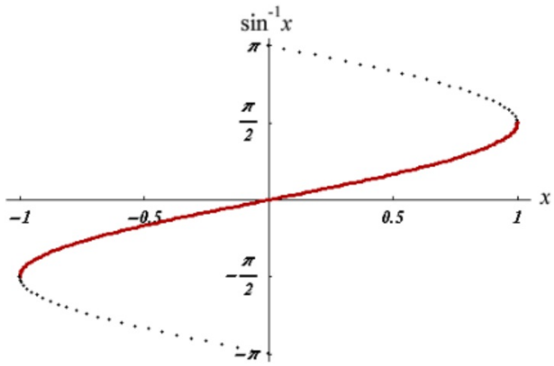
Inverse Trig Functions

Objective:

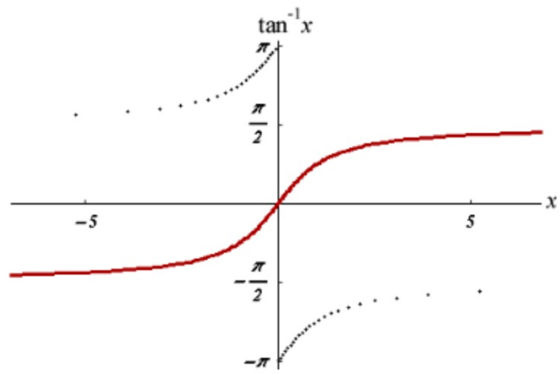
- Take derivatives of inverse trig functions

None of the six trig functions are one-to-one, so their domains must be restricted when talking about their inverses.

$f(x) = \sin^{-1} x$ or $f(x) = \arcsin x$



$f(x) = \tan^{-1} x$ or $f(x) = \arctan x$



If y=arcsinx, find dy/dx using implicit differentiation.

Let *u* be a differentiable function of *x*.

$$\frac{d}{dx}[\arcsin u] = \frac{u'}{\sqrt{1 - u^2}}$$

$$\frac{d}{dx}[\arccos u] = \frac{-u'}{\sqrt{1 - u^2}}$$

$$\frac{d}{dx}[\arctan u] = \frac{u'}{1 + u^2}$$

Ex.1: If $y = \tan^{-1}(1/x)$, find dy/dx.

Ex. 2: $\frac{d}{dx}\left[x \arctan \sqrt{x}\right]$

Ex.3: Find $\frac{d}{dx}[\arcsin(\frac{x}{2})]$

Ex.4: $y = \arctan x + \dfrac{x}{1 + x^2}$

Sometimes it is useful to use an identity replacement when dealing with compositions of trig and inverse trig functions.

Example 5: Rewrite $\tan(\arccos(x^2))$ as an algebraic expression

Example 6:

(Multiple Choice) Find the derivative of $f(x) = \cos\left(\tan^{-1}\frac{x}{\sqrt{6}}\right)$.

(A) $f'(x) = \frac{\sqrt{6}x}{\left(x^2+6\right)^{3/2}}$

(B) $f'(x) = \frac{x}{\left(x^2+6\right)^{3/2}}$

(C) $f'(x) = -\frac{\sqrt{6}}{\left(x^2+6\right)^{3/2}}$

(D) $f'(x) = -\frac{x}{\left(x^2+6\right)^{3/2}}$

(E) $f'(x) = -\frac{\sqrt{6}x}{\left(x^2+6\right)^{3/2}}$