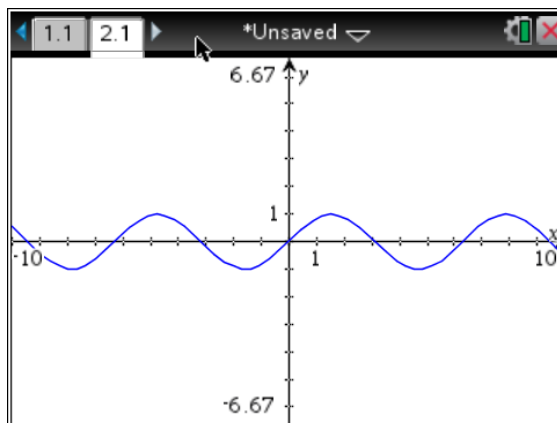


### 3.8 Derivatives of Trig Inverse Functions

#### Derivative of the Arcsine

$$y = \sin^{-1}(x) \text{ means } x = \sin y$$



Oct 4-10:24 PM

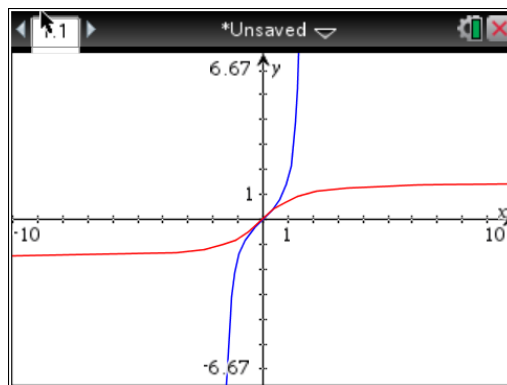
$$\frac{d}{dx}(\sin^{-1} x^2) =$$

$$\frac{d}{dx}\left(\sin^{-1} \frac{\sqrt{x}}{3}\right) =$$

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## Derivative of the Arctangent

$$y = \tan^{-1} x$$



What is the range of  $y = \tan^{-1}(x)$ ?

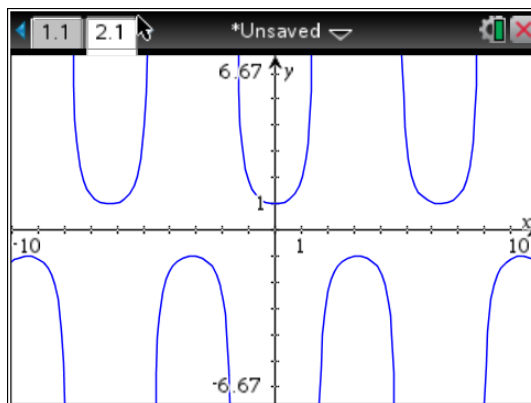
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A particle moves along the x-axis so that its position at any time  $t \geq 0$  is  $x(t) = \tan^{-1} \sqrt{t}$ . What is the velocity of the particle when  $t = 16$ ?

Oct 1-5:53 PM

### Derivative of the Arcsecant

$$y = \sec^{-1} x$$



Oct 1-5:57 PM

$$\frac{d}{dx}(\sec^{-1}(5x^4))$$

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Derivatives of the other 3 inverse functions:

$$\cos^{-1} x = \frac{\pi}{2} - \sin^{-1} x$$

$$\cot^{-1} x = \frac{\pi}{2} - \tan^{-1} x$$

$$\csc^{-1} x = \frac{\pi}{2} - \sec^{-1} x$$

Oct 1-6:10 PM

Derivative of an Inverse Function

If  $f$  is a function that is differentiable and its inverse is  $g$ , then  $g$  is differentiable at any  $x$  that  $f'(g(x)) \neq 0$

$$g'(x) = \frac{1}{f'(g(x))} \quad \text{meaning} \quad g'(x) = \frac{1}{f'(y)} = \frac{1}{\frac{dx}{dy}} \quad \text{i.e. they have reciprocal slopes}$$

Oct 4-10:24 PM

Let  $f$  be the function defined by  $f(x) = x^3 + x$ .

If  $g(x) = f^{-1}(x)$  &  $g(2) = 1$ , what is the value of  $g'(2)$  ?

Oct 5-9:34 AM