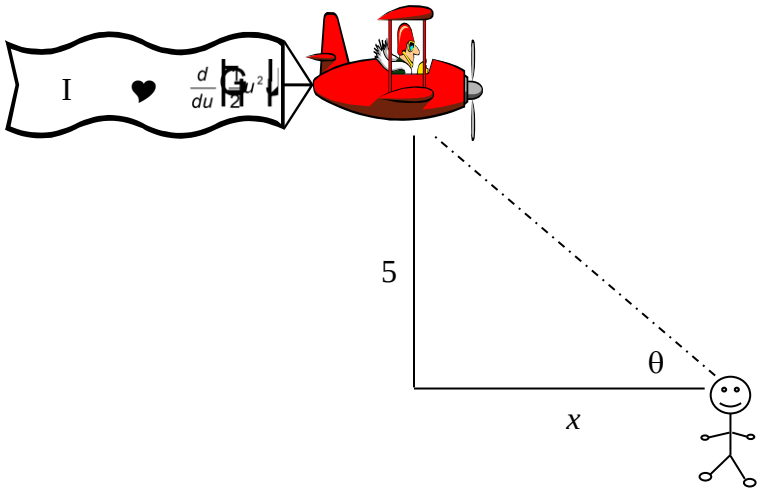
DATE:_____

Derivatives of Inverse Trig Functions

You are looking up at a plane flying about 5 miles above the ground. As the plane move closer to you, the angle of your head/eyes changes. What is the rate at which that angle is changing with respect to x?



Derivatives of Inverse Trig Functions

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

$$\frac{d}{dx}(\tan^{-1}x) = \frac{1}{1+x^2} \qquad \frac{d}{dx}(\cot^{-1}x) = -\frac{1}{1+x^2}$$

$$\frac{d}{dx}(\sec^{-1}x) = \frac{1}{|x|\sqrt{x^2-1}} \qquad \frac{d}{dx}(\csc^{-1}x) = -\frac{1}{|x|\sqrt{x^2-1}}$$

Example 1:

Find $\frac{dy}{dx}$ for $y = x\sin^{-1}(x)$

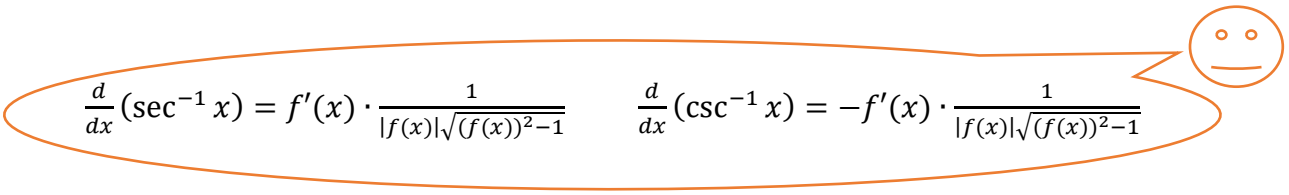
Example 2:

Given position of an object as described by $x(t) = \frac{\tan^{-1}t}{t^2+3}$ where $t \geq 0$. Find the velocity of the object when $t = 1$.

Derivatives of Inverse Trig Functions

$$\frac{d}{dx}(\sin^{-1} f(x)) = f'(x) \cdot \frac{1}{\sqrt{1-(f(x))^2}} \qquad \frac{d}{dx}(\cos^{-1} f(x)) = -f'(x) \cdot \frac{1}{\sqrt{1-(f(x))^2}}$$

$$\frac{d}{dx}(\tan^{-1} f(x)) = f'(x) \cdot \frac{1}{1+(f(x))^2} \qquad \frac{d}{dx}(\cot^{-1} f(x)) = -f'(x) \cdot \frac{1}{1+(f(x))^2}$$



$$\frac{d}{dx}(\sec^{-1} x) = f'(x) \cdot \frac{1}{|f(x)|\sqrt{(f(x))^2-1}} \qquad \frac{d}{dx}(\csc^{-1} x) = -f'(x) \cdot \frac{1}{|f(x)|\sqrt{(f(x))^2-1}}$$

Example 3:

Find $g'(x)$ for $g(x) = \cot^{-1}\sqrt{x}$

Example 4:

Write the equation of the line tangent to the curve $h(x) = \cos^{-1}\left(\frac{x}{2} - 1\right)$ at $x = 3$.