Derivatives of Inverse Trig Functions

p. 232 - 238 (3.6) # 32

$$\frac{d}{dx}(\arcsin u) = \frac{u'}{\sqrt{1 - u^2}} \qquad \frac{d}{dx}(\arccos u) = \frac{-u'}{\sqrt{1 - u^2}}$$

$$\frac{d}{dx}(\arctan u) = \frac{u'}{1 + u^2} \qquad \frac{d}{dx}(\text{arccot } u) = \frac{-u'}{1 + u^2}$$

$$\frac{d}{dx}(\text{arcsec } u) = \frac{u'}{|u|\sqrt{u^2 - 1}} \qquad \frac{d}{dx}(\text{arccsc } u) = \frac{-u'}{|u|\sqrt{u^2 - 1}}$$

Simplify.

1. $\frac{d}{dx}(\arcsin x^2) = \frac{2x}{\sqrt{1-(x^2)^2}}$

$= \frac{2x}{\sqrt{1-x^4}}$

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

$= \frac{-1}{\sqrt{x}(1+x)}$

**3. If $y = \text{Arctan}(\cos x)$, then $\frac{dy}{dx} = \frac{-\sin x}{1+\cos^2 x}$

$\cancel{y = \arctan(4(\tfrac{1}{4})) = \arctan(1)}$

**4. What is the slope of the line tangent to the curve y=arctan(4x) at the point at which x = 1/4?

$f'(x) = \frac{4}{1+(4x)^2} = \frac{4}{1+16x^2}$. $f'(\tfrac{1}{4}) = \frac{4}{1+16(\frac{1}{4})^2} = \frac{4}{1+1} = \frac{4}{2} = 2$