Worksheet #12: Inverse Trigonometric Functions

Generalized Derivative Formulas:

$$\frac{d}{dx}[\sin^{-1}(u)] = \frac{1}{\sqrt{1-u^2}}\frac{du}{dx} \qquad \frac{d}{dx}[\cos^{-1}(u)] = \frac{-1}{\sqrt{1-u^2}}\frac{du}{dx}$$

$$\frac{d}{dx}[\tan^{-1}(u)] = \frac{1}{1+u^2}\frac{du}{dx} \qquad \frac{d}{dx}[\cot^{-1}(u)] = \frac{-1}{1+u^2}\frac{du}{dx}$$

$$\frac{d}{dx}[\sec^{-1}(u)] = \frac{1}{|u|\sqrt{u^2-1}}\frac{du}{dx} \qquad \frac{d}{dx}[\csc^{-1}(u)] = \frac{-1}{|u|\sqrt{u^2-1}}\frac{du}{dx}$$

1. Find $\frac{dy}{dx}$ for the following:

a) $y = 2x\sec^{-1}(x)$

b) $y = \frac{\tan^{-1}(x)}{x^2}$

c) $y = \cot^{-1}(e^{3x})$

d) $y = \sin\left(e^{\cos^{-1}(2x)}\right)$

e) $y = \csc^2(x) + \sin^{-1}\left(x^2\right) + \frac{1}{\sin^{-1}(x)}$

2. Derive the derivative $\frac{dy}{dx}$ for the following by solving for x and then using implicit differentiation:

$y = \sin^{-1}(x)$ iff $x =$?

3. Derive the derivative $\frac{dy}{dx}$ for the following by solving for x and then using implicit differentiation:

$y = \cot^{-1}(x)$ iff $x =$?