

Name:

Math 105 Quiz 6 covering §3.3-§3.5 **Show all work for credit.**

1. $f(x) = 2 \arctan(3e^{5x})$, find $f'(x)$.

$$f'(x) = \frac{2}{1 + (3e^{5x})^2} * 15e^{5x}$$

2. Find the slope of the tangent line to the hyperbola $x^2 - y^2 = 1$ at the point $(\sqrt{3}, \sqrt{2})$.

$$2x - 2yy' = 0$$

$$y' = x/y, \text{ so } y' = \frac{\sqrt{3}}{\sqrt{2}} \text{ is the slope of the tangent line.}$$

3. Differentiate $y = x^2 \arcsin(3x + 1)$.

$$2x \arcsin(3x + 1) + x^2 * \frac{1}{\sqrt{1 - (3x + 1)^2}} * 3$$

4. Use logarithmic differentiation to find the derivative of the function $y = \frac{\sqrt{x} e^x \sin(4x)}{(x^2 + 1)^6}$.

$$\ln(y) = \frac{1}{2} \ln(x) + x + \ln(\sin(4x)) - 6 \ln(x^2 + 1)$$

$$\frac{y'}{y} = \frac{1}{2x} + 1 + \frac{4\cos(4x)}{\sin(4x)} - \frac{12x}{x^2 + 1}$$

$$y' = \left(\frac{1}{2x} + 1 + \frac{4\cos(4x)}{\sin(4x)} - \frac{12x}{x^2 + 1} \right) * \left(\frac{\sqrt{x} e^x \sin(4x)}{(x^2 + 1)^6} \right)$$

5. Find the antiderivative $F(x)$ for the function $f(x)$. Check your answer.

$$f(x) = \frac{2x}{1 + x^2}$$

$$F(x) = \ln(1 + x^2) + C.$$

$$F'(x) = \frac{2x}{1 + x^2}.$$