

Name: _____

MA 2310 - Mastery Quiz 3: Chapter 3

Show all work and answers on a separate sheet of paper.

1. Compute the derivatives of the following functions:

- (a) $f(x) = \tan^{-1}(x)$
- (b) $f(x) = \tan^{-1}(x^2)$
- (c) $f(x) = \ln(x^2 + 1)$
- (d) $f(x) = \sec(x^2 + 1)$
- (e) $f(x) = \csc(x^2 + 1)$
- (f) $f(x) = \sin(x^3)e^{x^2+1}$

2. Find the $\frac{dy}{dx}$ for $\ln y = x \ln(x)$.

3. Find the $\frac{dy}{dx}$ for $\ln y = \sin(x) \ln(\cos(x))$.

4. Derive the formula for $\frac{d}{dx}[\sin^{-1}(x)]$.

5. One airplane flies toward NYC from the 50 miles north of the city at 150 mi/hr. Another airplane is 40 miles east of NYC is approaching at 200 mi/hr. Find the rate at which the distance between the planes changes.

6. A conical water tank is draining at a rate of $0.5 \text{ ft}^3/\text{sec}$. The tank is 20 feet high and the radius of the tank is 10 feet. When the tank is half full how fast is the height of the water dropping in the tank? Note the height to radius ratio is 20 to 10, that is $h/r = 20/10$.