Test 3 **MA 125-CT** **October, 2013**

Name: _____ **Signature:** _____

SHOW ALL YOUR WORK!

If you have time, find a way to check your answers.

Part 1

1. [5 points] Evaluate $\lim_{y\to 0^+} (1-3y)^{\frac{1}{y}}$

2. [5 points] Find the limit: $\lim_{s\to\infty} \dfrac{e^{3s}-1}{e^{3s}+1}$

3. [5 points] Differentiate $e^{\tan x}$.

4. [5 points] Simplify the expression $\sin(\cos^{-1}(u))$

5. [5 points] Find the linearization $L(x)$ of the function $f(x)$ at 4 for

$$f(x) = \sqrt{x}$$

6. [5 points] Differentiate $\ln(\sin^{-1}(x))$

Part 2

1. [12 points] Use logarithmic differentiation to calculate the derivative of

$$y = \frac{x^{\frac{3}{4}}\sqrt{x^2+1}}{(6x+6)^5}$$

2. [15 points] Find an equation of the tangent line to the curve $y = 2 + x\ln(x)$ at the point (1, 2).

3. [14 points] Differentiate $2^{\sin x} - (\ln x)^2$.

4. [15 points] Differentiate $f(x) = x\cos^{-1}(\sqrt{x})$

5. [14 points]

   (a) Find the linearization of the function $f(x) = \cos(x)$ at $a = \frac{\pi}{2}$.

   (b) Use the linearization to estimate $\cos\left(\frac{\pi}{2} + \frac{1}{10}\right)$.