MA 125 - 6B, CALCULUS I
October 24, 2012

Name (Print last name first): ....

Student Signature: ....

TEST III

No calculators are allowed!

PART I

Part I consists of 10 questions. Clearly write your answer in the space provided after each question. Show your work as much as possible.

Each question in Part I is worth 5 points.

Question 1. Differentiate the function $f(x) = e^{3x}\cos(5x)$

Answer: ....

Question 2. Differentiate the function $f(x) = \frac{\ln|x|}{x}$

Answer: ....

Question 3 Differentiate the function $f(x) = x^2 \tan^{-1}(x)$

Answer: ....

Question 4 Differentiate the function $f(x) = \ln(\sin(x^2))$

Answer: ....

Question 5 Find the limit

$$\lim_{x \to \infty} \tan^{-1}(x^2)$$

Answer: ....

Question 6 Find a formula for the inverse of the function $y = \ln(x - 5)$

Answer: ....

<u>Question 7</u> Use l'Hospital's rule to find the limit

$$\lim_{x\to\infty} \frac{x^2+x}{e^{4x}+1}$$

Answer: ....

<u>Question 8</u> Use l'Hospital's rule to find the limit

$$\lim_{x\to 0} \frac{\sin 8x}{x+\tan x}$$

Answer: ....

<u>Question 9</u> Use l'Hospital's rule to find the limit

$$\lim_{x\to 0^+} x^2 \ln x$$

Answer: ....

<u>Question 10</u> Use l'Hospital's rule to find the limit

$$\lim_{x\to 0^+} x^{x^2}$$

Answer: ....

PART II

Each problem is worth 10 points.

Part II consists of 5 problems. You must show your work on this part of the test to get full credit. Displaying only the final answer (even if correct) without the relevant steps will not get full credit.

Problem 1

Use logarithmic differentiation to find y' if

$$y = \frac{(x+1)^4}{e^x\sqrt{x^2-1}}$$

Problem 2

Use logarithmic differentiation to find y' if

$$y = [\cos x]^{\sin x}$$

Problem 3

Simplify $y = \cos(\arcsin x)$, then find y'.
For an extra credit, find y' in two ways: before simplification and after simplification. Do your answers agree?

Problem 4

Use a linear approximation of the function $f(x) = \sqrt{x}$ at an appropriate point to approximate the value of $\sqrt{25.1}$

Problem 5

Use Newton's method with the initial approximation $x_1 = 0$ to find x_2, the second approximation to the root of the equation

$$x^3 + 3x + 3 = 0$$

For an extra credit, find x_3, the third approximation to the root.