MA 125, CALCULUS I
October 20, 2011

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 and simplify your answer when possible

Each question is worth 5 points.

Question 1

Differentiate the function $y = f(x) = \ln(x^3 - x)$.

Answer: .....

Question 2

Differentiate the function $y = f(x) = e^{x^3 - x}$.

Answer: .....

Question 3

Differentiate the function $y = f(x) = x^3 \arctan(\sqrt{x})$.

Answer: .....

Question 4

Differentiate the function $y = f(x) = \arcsin(3x)$.

Answer: .....

Question 5

Evaluate $\lim_{x \to 0} \dfrac{x^2 + 5}{\cos(x)}$

Answer: .....

Question 6

Evaluate $\lim_{x \to 0} \dfrac{e^x - x - 1}{x^2}$.

Answer: .....

Question 7

Find y' if $y = \frac{\ln(5^x)}{x}$.

Answer: .....

Question 8

Simplify $\cos(\arcsin(x))$.

Answer: .....

Question 9

Find the linearization of $f(x) = \tan(x)$ at $a = \pi/4$.

Answer: .....

Question 10

Use Newton's method to find the second approximate solution x_2 to the equation $\cos(x) = \tan(x)$ if $x_1 = \pi/4$.

Answer: .....

PART II

Part II consists of 4 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. Simplify when possible (unless otherwise indicated).

Problem 1; 13 points

Use logarithmic differentiation to find the derivative of $y = \dfrac{(x^2+1)^x \sqrt[3]{x+1}}{(3x^2+x)^7}$. **You do not need to simplify or combine fractions but you must express your answer in x (and not in y).**

Problem 2; 11 points

Evaluate

$$\lim_{x \to 0^+} \sin(x)^{\cos(x)}$$

Problem 3; 12 points

Suppose that the side of a square is $x = 5\ m$ with an error less than $\frac{1}{10}\ m$.
(a) Use differentials to approximate the error in the area.

(b) Use (a) to find the relative error of the area.

(c) Use (b) to find the percentage error of the area.

Problem 4; 14 points

3a) Evaluate $\lim_{x\to\infty} x + \sqrt{x^2+1}$

3b) Evaluate $\lim_{x\to\infty} x - \sqrt{x^2+1}$

3c) Evaluate $\lim_{x\to\infty} \dfrac{x}{\sqrt{x^2+1}}$

SCRATCH PAPER