CALCULUS I, TEST III

MA 125 NAME_____

100 points/ No calculator Spring, 2012

<u>Part 1.</u> Part 1 consists of 6 questions. Show all work, and clearly indicate your answer in the space provided after each question. (5 points each.)

1. Differentiate the function $f(x) = \dfrac{x}{\ln(x^2)}$ and write your answer in simplest form.

2. Evaluate $\lim\limits_{x \to 0} \dfrac{e^{2x} - 1}{\sin(5x)}$.

3. Find the value(s) of x for which the graph of the following function has a horizontal tangent.
   $y = x^3 e^x$

4. Differentiate the function $f(x) = 2^{\tan x} + (\ln(x))^2$

5. Differentiate the function $g(x) = \ln(\sec x)$.

6. Simplify $y = \tan(\arcsin x)$.

<u>PART 2.</u> Part 2 consists of 5 problems worth 14 points apiece. Show all your work for full credit! Displaying only the final answer (even if correct) without the relevant steps is not enough.

1. a. Differentiate the function $y = e^{x\sin x}$.

b. Differentiate the function $f(x) = \ln\sqrt{\dfrac{x+3}{x-3}}$. Simplify your answer as much as possible.

2. Evaluate the following limits. Remember to show all work.

a. $\lim_{x\to 0^+} \frac{\ln x}{x}$

b. $\lim_{x\to 0^+} \left(\frac{1}{\sin x} - \frac{1}{x^2} \right)$

c. $\lim_{x\to 0} (1-2x)^{1/x}$

3. a. Find the linearization, i.e. the linear approximation of the function $f(x) = \sin x$ at $a = \pi/4$. -4-

b. Use Newton's method to find a second approximation x_2 to the solution of the equation $x^2 = 1 - x$ given an initial guess of $x_1 = -2$.

4. The radius of a circular disk is given as 10 cm. with a maximum error in measurement of 0.2 cm.

a. Use differentials to estimate the maximum possible error in calculating the area of the disk (in cm^2).

b. What is the relative error in calculating the area?

c. What is the percentage error?

5. a. Solve $\frac{1}{2}\ln(x+1)=1$.

b. Differentiate the function $y=\sin^{-1}(\sqrt{9x})$ and put your answer in simplest form.

c. Use logarithmic differentiation to find the derivative of the function $y=x^{3\sin x}$