MATH 124 C
Exam II
February 23, 2010

Name ________________________________

Student ID #________________________ Section _______________________

HONOR STATEMENT

“I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam.”

SIGNATURE: ________________________________

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- Your exam should consist of this cover sheet, followed by six problems. Check that you have a complete exam.
- Show all work and justify your answers.
- Unless otherwise indicated, your answers should be exact values rather than decimal approximations. (For example, \( \pi/4 \) is an exact answer and is preferable to its decimal approximation 0.7854.)
- You may use a scientific calculator and one 8.5×11-inch sheet of handwritten notes. All other electronic devices (including graphing calculators) are forbidden.
- Turn your cell phone OFF and put it AWAY for the duration of the exam.

GOOD LUCK!
1. (12 points) Compute $\frac{dy}{dx}$. DO NOT SIMPLIFY.

(a) $y = \sqrt{\tan^{-1}(e^{\sin x})}$

(b) $y = \ln(\ln(\sec(4x)))$

(c) $y = 2^{\cos x}$

(d) $y = x^{\sqrt{x}}$
2. (8 points) Find the equation of the line tangent to the curve given by

\[ \pi x + \sin(x - xy) = 3y^3 + x^2 \]

at the point \((\pi, 0)\).
3. (8 points)

(a) Find the linear approximation of \( f(x) = \sqrt{x + 3} \) at \( x = 1 \).

(b) Use your answer to (a) to estimate \( \sqrt{4.05} \).
4. (8 points) Find the absolute maximum and minimum values of \( f(x) = xe^{-x} \) on the interval \([-1, 2]\). Show all work and give exact values for your answers in the blanks below.

ANSWERS: The absolute maximum value of \( f(x) \) is ________________.

The absolute minimum value of \( f(x) \) is ________________.

5. (6 points) Consider the parametric curve given by

\[
x = 3t^2 - t, \quad y = 5t^2 + t.
\]

Give the equation of the horizontal line that is tangent to this curve.
6. (8 points) A cylindrical can is undergoing a transformation in which its radius and height are varying with time. The height of the can is always twice its radius and the height is increasing at the rate of 0.5 mm/sec. Find the rate at which the volume of the can is changing when its radius is 50 mm. (The volume of a cylinder is $V = \pi r^2 h$.)