Math 53 Midterm #1, 2/27/07, 3:40 PM – 5:00 PM
(no leaving the exam between 4:45 and 5:00)

No calculators or notes are permitted. Please write your solution to each of the 7 questions on a separate sheet of paper with your name, GSI, and SID number on it. Each of the 7 questions is worth 10 points. To get full credit for a question, you must obtain the correct answer, put a box around the correct answer, and show correct work. (To avoid losing points, cross out incorrect work.) Good luck!

1. Find the plane that contains the point (1, 2, 3) and the line \( x = y = z \).
   (Write your answer in the form \( ax + by + cz = d \).)

2. Find parametric equations for the tangent line to the curve
   \[
   x = t^2 - 1, \quad y = t^2 + 1, \quad z = t + 1
   \]
at the point \((-1, 1, 1)\).

3. Suppose \( z \) is a function of \( x \) and \( y \) defined implicitly by
   \[
e^{yz} = x + z.
   \]
   Calculate \( \frac{\partial z}{\partial y} \) when \( x = 2 \) and \( y = 0 \). (Your answer should be a number.)

4. Find the area of the surface obtained by rotating the curve
   \[
x = 3t - t^3, \quad y = 3t^2, \quad 0 \leq t \leq 1
   \]
around the \( x \)-axis.

5. Either compute the following limit, or explain why it does not exist:
   \[
   \lim_{(x,y)\to(0,0)} \frac{(x+y)^2}{x^2 + y^2}.
   \]

6. At what angle do the lines \( 2x + y = 3 \) and \( 3x - y = 4 \) intersect?

7. (a) Sketch the curve given in polar coordinates by \( r^2 = \cos \theta \).
    (b) Find the area of the region enclosed by this curve.