Mathematics 202
Examination 1
February 13, 2004

Name_____________________________

Do all of your work in the blue booklets. Please label your answers clearly, as I will not have time to perform extensive searches for answers. When you are finished with the exam, please put this examination inside of the blue booklet. No credit will be given for answers without explanations.

Cheating will result in a failing grade.

The problems are not arranged in order of increasing difficulty, so you might want to read all of them before beginning.

Calculators are not permitted on this examination.

1. (15 points) Let \( \mathbf{v} = (4, 3, -1) \) and \( \mathbf{w} = (6, 3, 4) \). Compute \( \mathbf{v} \times \mathbf{w}, \mathbf{v} \cdot \mathbf{w}, \) and \( \|\mathbf{v}\| \).

2. (15 points) Find an equation for the plane that goes through the points (4, 2, 9), (6, 3, 1), and (3, 8, -2).

3. (15 points) For each of the following two functions, compute \( \nabla f \):

\[
\begin{align*}
f(x, y) &= e^x \cos y \quad f(x, y, z) = \tan z + 2xy
\end{align*}
\]

4. (10 points) Find the equation of the tangent plane to the graph of \( z = xe^{2y} \) at the point (3, 0, 3).

5. (15 points) Find the area of the parallelogram with vertices (10, 13, -13), (13, 11, -5), (9, 10, -11), and (14, 14, -7).

6. (15 points) Consider the two lines \( \mathbf{l}_1(t) = t(3, 1, 4) + (14, 12, -1) \) and \( \mathbf{l}_2(t) = t(4, 2, 1) + (12, 12, -8) \). Do these lines intersect? If so, find the point of intersection. Be sure to explain your answer fully.

7. (15 points) The two lines \( ax + by = 0 \) and \( ax + by = c \) are parallel in the \( xy \)-plane. Find the distance between them in terms of \( a, b, \) and \( c \).