MATH 210 **EXAM 2** **FALL 1992**

NAME: (PRINT) _____

SIGNATURE: _____

SSN: _____

Show your work in the space provided.

1. For $z = \sin(xy^2)$, $x = r\cos\theta$, and $y = r\sin\theta$, find $\dfrac{\partial z}{\partial r}$.

2. Find the equation of the tangent plane to the surface $z = x^2 - 3y^2$ at the point $(2, 1, 1)$.

3. Let $f(x, y, z) = \frac{x}{y} - z^2$ and $P = (3, -1, 2)$.

   a) In what direction from the point P is f increasing most rapidly?

   b) In what direction from P is f decreasing most rapidly?

   c) Find the rate of change of f at P in the direction of $\vec{w} = \langle 3, 0, 4 \rangle$.

4. Sketch the region of integration and change the order of integration for

$$\int_{-1}^{1} \int_{0}^{1-y^2} f(x, y) dx dy$$

5. Locate and classify all critical points of the function

$$f(x, y) = x^2 + y^2 + x^2 y + 1.$$

6. Find the points on the surface $z^2 = xy + 1$ that are nearest to the origin.

7. Evaluate $\int_0^{\pi/2} \int_0^1 x \sin(xy) dy dx$.

8. By changing to polar coordinates, find $\int_0^2 \int_0^{\sqrt{4-x^2}} e^{-x^2-y^2}\, dydx$