

Calc III - 3450:223  
EXAM #2 Fall 99

NAME \_\_\_\_\_  
ROW \_\_\_\_\_

100 Points

Show ALL your work.

1. Find all the first partial derivatives of  $f(x, y, z) = \sin(y^3 e^{x^2 yz})$ . You do not have to simplify your answers.

10 Points

2. Classify the critical points of  $f(x, y) = x^3 - 3xy + y^3 - 5$ .

12 Points

22 Points

3. Given  $f(x, y) = \frac{y^2 - 3x^2}{x^2 - 3y^2}$ , determine  $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$  and determine where  $f(x, y)$  is continuous.

10 Points

4. If  $z = x + f(y^2 - x^2)$ , where  $f$  is a differentiable function, then determine  $x \frac{\partial z}{\partial y} + y \frac{\partial z}{\partial x}$ .

10 Points

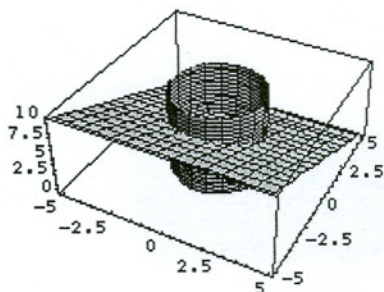
5. Find the domain, range, and sketch two level curves of  $z = \sqrt{25 - x^2 - 5y^2}$ .

10 Points

30 Points

6. The plane  $y + z = 3$  intersects the cylinder  $x^2 + y^2 = 5$  in an ellipse. Find parametric equations for the tangent line to this ellipse at the point  $(1, 2, 1)$ .

12 Points



7. Find the equation of the plane tangent to  $x^2 + y^2 = z^2 + 2xy - 4xz + 4$  at the point  $(1, 0, 1)$ .

12 Points

24 Points

8. The temperature at any point in the metal ball  $(x - 3)^2 + (y - 2)^2 + (z - 5)^2 \leq 9$  is given by  $T(x, y, z) = xz\sqrt{y}$ . Find the rate of change of  $T$  as you move from the point  $(5, 4, 6)$  on the surface of the ball towards the center of the ball.

12 Points

9. Use Lagrange multipliers to find the maximum and minimum temperature on the surface of the sphere  $x^2 + y^2 + z^2 = 9$  if the temperature at any point on the surface is given by  $T(x, y, z) = 2x + y - 2z$ .

12 Points

24 Points