

MA 227: CALCULUS II  
MIDTERM TEST #2, OCTOBER 13, 2005

Time limit: 105 min.

Your name (print):

Your signature:

1. The ellipsoid  $16x^2 + 4y^2 + z^2 = 16$  intersects the plane  $z = 2$  in an ellipse. Find parametric equations for the tangent line of this ellipse at the point  $(\sqrt{2}/2, -1, 2)$ .  
10 points

2

2. Find all the second partial derivatives of  $f(x, y) = e^{-x} \cos(xy)$ .

10 points

3. Find an equation of the tangent plane to the parametric surface  $x = u^2$ ,  $y = v^2$ ,  $z = uv$  at the point for which  $u = v = 1$ .

10 points

4

4. Let  $a = xe^{y+z^2}$ ,  $x = 2uv$ ,  $y = u - v$ ,  $z = u + v$ . Find  $\partial a/\partial u$  and  $\partial a/\partial v$  when  $u = 3$ ,  $v = -1$ .

10 points

5. Find  $\partial z/\partial x$  and  $\partial z/\partial y$  if  $x^2 + y^2 + z^2 = xyz + 2$ .

10 points

6

6. Find the maximum rate of change of the function  $f(x, y) = xe^{-y} + ye^{-x}$  at the origin and the direction in which this rate of change occurs.

10 points

7. Find the global minimum and maximum *values* of the function  $f(x, y) = 3x^2 - y^2 + y$  on the square

$$\{(x, y) \mid |x| \leq 1, |y| \leq 1\}.$$

10 points

8

8. Find the local minimum and maximum values and saddle points of the function  
 $f(x, y) = xy^2e^{-x^2-y^2}$ .

10 points



9. Find the minimum and maximum values of the function  $f(x, y, z) = x^6 + y^6 + z^6$  on the unit sphere  $x^2 + y^2 + z^2 = 1$ .

10 points

10. Find the minimum and maximum values of the function  $f(x, y, z) = 3x - y - 3z$  subject to the constraints  $x + y - z = 0$ ,  $x^2 + 2z^2 = 1$ .

10 points