Mth 254, Midterm Examination May 7, 2001

#s 1 to 4 are 17 pts each. #s 5 and 6 are 16 pts each.

1. Find the equation of the tangent plane to the surface $f(x,y) = 4 - x^2 - 2y^3$ at the point $(1,1,1)$.

2. Evaluate the following double integral by one of the techniques covered in class. Show all of your work to receive any credit.

$$\iint_R \sin(x+y)dA \text{ where } R = [0, \frac{\pi}{2}] \times [0, \frac{\pi}{2}]$$

3. **(a)** For which specific unit vector **u** is $D_{\mathbf{u}}f(1,2)$ a maximum, where $f(x,y) = x^2y + 2xy^2$

(b) Compute $D_{\mathbf{u}}f(1,2)$ for **u** as in part (a).

4. The function $f = f(x,y)$ is a function of x and y, and both $x = x(u,v)$ and $y = y(u,v)$ are in turn functions of u and v.

Given the following information, compute $\frac{\partial f}{\partial u}(1,2)$.

$$f(3,4) = 5 \qquad x(1,2) = 3 \qquad y(1,2) = 4$$

$$\frac{\partial f}{\partial x}(3,4) = 6 \qquad \frac{\partial f}{\partial y}(3,4) = -2$$

$$\frac{\partial x}{\partial u}(1,2) = 5 \qquad \frac{\partial x}{\partial v}(1,2) = -1 \qquad \frac{\partial y}{\partial u}(1,2) = -3 \qquad \frac{\partial y}{\partial v}(1,2) = 3$$

5. Find an equation of the plane through the point $(1,1,1)$ that has normal vector parallel to the line

$$\frac{x-2}{3} = \frac{y-1}{2} = \frac{z+2}{-1}$$

6. Find the distance between the planes

$2x + 2y + 2z = 4$, and

$2x + 2y + 2z = 6$