MATH 223 - 06 Test # 1

10 February 1997

Part I. [25 points]

1. Complete the table below, knowing that it corresponds to a linear function, $z = f(x, y)$. Explain your answer.

x \ y	-1	0	1
-1			
0		1	-2
1			0

2. Which of the following equations corresponds to the above table ? Why ?

(a) $z = 2x - 3y + 2$

(b) $z = -2x - 3y + 1$

(c) $z = 2x - 3y + 1$

3. Draw a contour diagram for the function $z = f(x, y)$ found above. Label the level curves with reasonable values.

4. Find the equation of the plane parallel to the plane with equation $z = f(x, y)$ and going through the point $(1, 7, 6)$. Show all your work.

Part II. [15 points]

In each of the following cases, find $\vec{u} \cdot \vec{v}$ and $\vec{u} \times \vec{v}$ (show all your work):

(a) $\vec{u} = 3\vec{i} + 2\vec{j} - \vec{k}$ $\quad$ $\vec{v} = 6\vec{i} + 4\vec{j} - 2\vec{k}$

(b) $\vec{u} = \vec{i} + \vec{j}$ $\quad$ $\vec{v} = \vec{i} - \vec{j}$

(c) $\vec{u} = 2\vec{i} - 7\vec{j} + 3\vec{k}$ $\quad$ $\vec{v} = \vec{i} - 7\vec{j} + \vec{k}$

Part III. [40 points]

Draw contour diagrams for the functions below. For each diagram, show at least 4 level curves with labels.

$$(1)\quad z = (x+y)^2 \qquad (2)\quad z = 3x^2 - 2y^2$$

$$(3)\quad z = \frac{1}{x^2+y^2} \qquad (4)\quad z = \sqrt{x^2+y^2}$$

Part IV. [20 points]

Given the points $P = (1,1,1)$, $Q = (0,2,3)$ and $R = (2,0,0)$, find:

(a) A unit vector perpendicular to the plane containing P, Q, R.

(b) A unit vector which is parallel to the plane containing P, Q, R.

(c) The area of the triangle P,Q,R.

(d) The equation of the plane containing P, Q, R.