MA 225 PRACTICE MIDTERM I

1. (10 points)
   Find the area of the triangle with vertices $(0, 0, 0)$, $(1, 0, 1)$ and $(0, 1, 1)$.

2. (10 points)
   (a) (4 pts)
   Find the equation of a line passing through $(1, 2, 3)$ in the direction of $(-1, 0, 1)$.
   (b) (6 pts)
   Find the equation of a plane which is perpendicular to this line and which passes through the origin.

3. (10 points)
Sketch the graph of the surface $z = 1 - x^2 - y^2$.

4. (10 points) Find the limit $\lim_{(x,y)\to(0,0)} \frac{(x+y)^2}{x^2+y^2}$, or show that it does not exist.

5. (10 points) Let $f(x, y) = x^2 y$.

(a) (5 pts) Find a unit vector $\mathbf{u}$ for which the directional derivative $D_{\mathbf{u}} f(1, \sqrt{2})$ is greatest.

(b) (5 pts) Find a unit vector $\mathbf{u}$ for which $D_{\mathbf{u}} f(1, \sqrt{2}) = 0$.