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 $u$ for which the directional derivative $D_u f(1, \sqrt{2})$ is greatest.

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