Q1. Find 
(a) \( \lim_{(x,y) \to (0,0)} \frac{\sin(x^2+y^2)}{x^2+y^2} \) 
(b) \( \lim_{(x,y) \to (0,0)} \frac{x^4 - y^2}{x^4 + y^2} \)

Q2. Find \( \frac{\partial z}{\partial s} \) and \( \frac{\partial z}{\partial t} \) if \( z = e^{r} \cos \theta \), \( r = st \), \( \theta = \sqrt{s^2 + t^2} \)

Q3. Find \( \frac{\partial z}{\partial x} \) and \( \frac{\partial z}{\partial y} \) if \( x - z = \tan^{-1}(yz) \).
Q4  The derivative of $f(x, y, z)$ at a point $P$ is greatest in the direction of $\mathbf{v} = \mathbf{i} + \mathbf{j} - \mathbf{k}$. In this direction, the value of the derivative is $2\sqrt{3}$.

(a) What is $\nabla f$ at $P$?

(b) What is the derivative of $f$ at $P$ in the direction of $\mathbf{i} + \mathbf{j}$?

Q5  At what point on the parabolid $y = x^2 + z^2$ is the tangent plane parallel to the plane $x + 2y + 3z = 1$?