

1. (6 points) Determine if the following limit exists. Give reasons for your answer.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + 2y^2}{2x^2 + y^2}$$

2. (9 points) Find an equation of the tangent plane and a parametric representation of the normal line to the surface $z = f(x, y) = x^2 + 2y^2$ at the point on this surface corresponding to $x = 2, y = 1$.

3. (5 points) Given $w = f(x, y, z)$, and $x = g(t, s)$, $y = h(t, s)$, and $z = k(t, s)$. Write down the chain rule formula for $\frac{\partial w}{\partial s}$.