Math24 (1:50-2:40 pm) **Fall 2024** **Name:**

1. Find an equation of the tangent plane to the surface given by $z = 2x^2 + y^2 - 5y$ at the point $(1, 2, -4)$

Solution. $\partial z/\partial x = 4x$, $\partial z/\partial y = 2y - 5$. Therefore,

$$\frac{\partial z}{\partial x}\Big|_{P_0} = 4 \quad \text{and} \quad \frac{\partial z}{\partial y}\Big|_{P_0} = -1$$

The equation of the tangent plane:

$$z + 4 = 4(x - 1) - (y - 2) = 4x - y - 2$$

2. Use the chain rule to find $\partial z/\partial s$ and $\partial z/\partial t$, given that $z = x^2 \sin y$, $x = s^2 t$, $y = st$.

Solution.

$$\frac{\partial z}{\partial s} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial s} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial s} = 4xst \sin y + x^2 t \cos t$$

$$\frac{\partial z}{\partial t} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial t} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial t} = 2s^2 x \sin y + x^2 s \cos y$$