1. Find the equation of a tangent plane to $e^y + x + x^2 - z = -6$ at the point $(1, 0, 9)$.

2. (a) Compute the directional derivative of $f(x, y) = 3xy + y^2$ at $(2, 3)$ in the direction of $\underline{u} = \langle 3, -1 \rangle$.

   (b) Find the maximum possible directional derivative at $(2, 3)$ (choosing from any direction).

3. Let $z = f(x, y) = xy^2$ with $x = u \cos v$ and $y = u \sin v$. Let $\underline{x} = \begin{pmatrix} x \\ y \end{pmatrix}$ and $\underline{u} = \begin{pmatrix} u \\ v \end{pmatrix}$.

   Find $\dfrac{\partial z}{\partial \underline{x}}$ and $\dfrac{\partial \underline{x}}{\partial \underline{u}}$. Use the chain rule to find $\dfrac{\partial z}{\partial \underline{u}}$. Evaluate it at $u = 2, v = \pi/2$.