Your Name:_____ Signature:_____

TA Name:_____ Drill Time:_____

Quiz 5

Math 2574: Calculus III

Instructions: CLEARLY SHOW ALL YOUR WORK.

1. **[5 points]** Consider the function defined by the equation $f(x, y) = x^3 + e^{xy}$.

   (a) Find the derivative of f in the direction of the vector $\vec{u} = \langle \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \rangle$ at the point $(1, 2)$.

   (b) If you are standing at $(1, 2) \in \mathbb{R}^2$ (the domain of f), in which direction should you travel to maximize the rate of change of f? Please also calculate the maximal rate of change.

2. **[5 points]** Find the equation of the tangent plane to the surface in $\mathbb{R}^3$ defined by $z = \ln(2x + y)$ at the point $(1, -1, 0)$.