

Solutions: quiz 5, discussion section 10am

Math 226, Fall 2019, Prof. Mazel-Gee

1. This is the graph $z = f(x, y)$ of the function $f(x, y) = ye^{xy}$. We compute that $f_x(x, y) = y^2e^{xy}$, so that $f_x(0, 1) = 1$. We also compute that $f_y(x, y) = e^{xy} + xye^{xy}$, so that $f_y(0, 1) = 1$. Therefore, an equation of the tangent plane is $z - 1 = x + (y - 1)$.
2. We compute the values

$$\begin{aligned}z(0, -1) &= 0^2 - 0 \cdot (-1) + 3 \cdot (-1)^2 = 3 \quad \text{and} \\z(0.1, -0.9) &= 0.1^2 - 0.1 \cdot (-0.9) + 3 \cdot (-0.9)^2 = 0.01 + 0.09 + 3 \cdot 0.81 = 2.53 ,\end{aligned}$$

so that $\Delta z = 2.53 - 3 = -0.47$. Meanwhile, we have that

$$dz = \frac{\partial z}{\partial x} dx + \frac{\partial z}{\partial y} dy = (2x - y)dx + (-x + 6y)dy .$$

Setting $(x, y) = (0, -1)$, $dx = \Delta x = 0.1$, and $dy = \Delta y = 0.1$, we compute that

$$dz = (2 \cdot 0 - (-1)) \cdot 0.1 + (-0 + 6 \cdot (-1)) \cdot 0.1 = 0.1 - 0.6 = -0.5 .$$