

Note: The score you earn will be based on the correctness of your solutions. A “right answer” will earn no credit without a correct solution to support it.

(6 points) 1. Compute the following limits if they exist:

(a) $\lim_{(x,y) \rightarrow (0,0)} \frac{e^{xy} - 1}{y}$

(b) $\lim_{(x,y) \rightarrow (0,0)} \frac{\cos(xy) - 1}{x^2 y^2}$

(6 points) 2. Where is the function $f(x, y) = \frac{1}{x^2 + y^2}$ continuous?

(6 points) 3. Where does the plane tangent to $z = e^{x-y}$ at $(1, 1, 1)$ meet the z -axis?

(6 points) 4. Compute the gradients of the following functions:

(a) $f(x, y, z) = x \exp(-x^2 - y^2 - z^2)$ (Note that $\exp(u) = e^u$.)

(b) $f(x, y, z) = \frac{xyz}{x^2 + y^2 + z^2}$

(6 points) 5. Find an equation for the tangent plane to $z = x^2 + 2y^3$ at $(1, 1, 3)$.

(6 points) 6. Suppose $f : \mathbb{R}^n \rightarrow \mathbb{R}^m$ is a linear map. What is the derivative of f ?