

YOUR NAME: _____

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Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Compute all first-order partial derivatives of the following functions (using the correct notation to indicate which derivative you are computing) and simplify, whenever possible:

(a) $f(x, y) = \ln(x^2 + y^2)$

(b) $g(x, y) = \frac{x}{\sqrt{x^2 + y^2}}$

(c) $h(x, y) = e^{\sin x \cos y}$

2. Find the linearization $L(x, y)$ of the function $f(x, y) = \frac{x^2}{y^2 + 1}$ at $(4, 1)$.

3. (a) Calculate $\frac{d}{dt}g(\mathbf{c}(t))$ at $t = 1$, where $g(x, y, z) = xye^z$ and $\mathbf{c}(t) = (t^2, t^3, t - 1)$.

(b) Find the directional derivative of $f(x, y) = x^2 \ln y$ at the point $P = (2, e)$ in the direction pointing to the origin.