

Name _____ Date _____

Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

1. Find the directional derivative of $f(x, y) = 2x^4 - 2x + 5xy^2 + xy$ at $\mathbf{p} = (1, 1)$ in the direction of $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j}$.

2. In what direction \mathbf{u} does $f(x, y) = 4 + x^3y - x^2y^2$ increase most rapidly at $\mathbf{p} = (1, 2)$?
- Answer : _____

Answer: _____

3. Find ∇F given $F(x, y, z) = 2x^2z - y^4 - xyz^2$.

Answer: _____

4. Find the equation of the tangent plane to $f(x, y) = y^2 + 2x^2 - 6x^2y^3$ at $\mathbf{p}_0 = (2, 1)$.

Tangent Plane : _____