

Show all work clearly and in order, and circle your final answers. Justify your answers.

PROBLEM ONE Find the directional derivative of $f(x, y) = x^2 + 3xy^3 + x^4y^2$ in the direction of $\vec{u} = \langle 1, 3 \rangle$

PROBLEM TWO For the function $f(x, y)$ from (1), at the point $(1, 1)$ what is the maximum rate of change and in what direction does it occur?