

Math 2415
Paper Homework #8

1. Find the directional derivative of $f(x, y) = xy^2$ in the direction $\theta = \frac{\pi}{6}$ at the point $(2, 4)$.
2. Find the maximum rate of change of $f(x, y) = x^2 + y^2 - 4x - 6y$ at the point $(1, 2)$. In what direction does it occur?
3. Let $f(x, y) = xy$.
 - (a) Calculate ∇f at the point $(2, -2)$
 - (b) Find an equation for the tangent line to the level curve of f through the point $(2, -2)$.
 - (c) On a single set of axes, sketch the level curve, gradient and tangent line you calculated above.
4. Find all local maxima, local minima, and saddle points of $f(x, y)$, if any, given that the partial derivatives of f are $f_x = 3x^2 + 12y^2 - 3$ and $f_y = 24xy$.
5. Find all local maxima, local minima, and saddle points of the function $f(x, y) = 8x^3 + y^3 + 6xy$.
6. Find and classify the critical points of $f(x, y) = -3x^2 - 4xy - y^2 - 12y + 16x$.