

Maxima and Minima

1. Find all critical points of $f(x, y) = x^2 + y^2$.
2. Find all critical points of $f(x, y) = -x^2 - y^2 - 4xy$.
3. Let $f(x, y)$ be a function of two variables and $\vec{u} = \langle \frac{3}{5}, \frac{4}{5} \rangle$. Write $D_{\vec{u}}(D_{\vec{u}}f)$ in terms of f_{xx} , f_{xy} , and f_{yy} . (You may assume, as we do most of the time, that f and all of its derivatives are continuous.)
4. Find all critical points of $f(x, y) = xy^2 - x^2 - 2y^2$ and determine whether each is a local minimum, local maximum, or saddle point.

5. Find the absolute maximum and minimum values of $f(x, y) = y^2 - x^2$ on the square $|x| \leq 1, |y| \leq 1$.