MATH 134A+105A+110A Review: Lagrange Multiplier Method

Facts to Know

To find the absolute/global maximum and minimum values of \( f(x, y) \) subject to the constraint \( g(x, y) = k \)

(a) Find all values of \( x, y, \lambda \) such that

\[
\begin{align*}
\nabla f(x, y) &= \lambda \nabla g(x, y) \\
g(x, y) &= k
\end{align*}
\]

(b) Evaluate \( f \) at all the points \((x, y)\) that result from the previous step. The largest of these values is the maximum value of \( f \); the smallest is the minimum value of \( f \).

Examples

1. Maximize \( f(x, y) = x + y \) subject to the constraint \( x^2 + y^2 = 1 \).
2. Maximize $f(x, y) = x^2y$ subject to the constraint $x^2 + y^2 - 3 = 0$. 