Vv285 Recitation Class 11
Extrema of Multi-Variable Functions

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Outline

Calculating Extrema

Suppose $f : \Omega \to \mathbb{R},\ \Omega \subseteq \mathbb{R}^n$, the procedures of calculating extrema of f are listed as follows:

1. Calculate the critical point: $\frac{\partial f}{\partial x_1} = 0, ..., \frac{\partial f}{\partial x_n} = 0$. Solve for vectors such that $\nabla f(x) = 0$. Suppose found $\{P\}_i$, a set of critical points.
2. Calculate the Hessian at each P_i and determine whether it's positive definite, negative definite or other. Determine local maximum and local minimum.
3. Special check at $\partial\Omega$. Compare to value in step 2 and conclude on global maximum and global minimum.

Practice - Analyse multivariable functions

TASK

Find and classify all the critical point of $f(x, y) = 4 + x^3 + y^3 - 3xy$

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Find the absolute minimum and absolute maximum of $f(x, y) = 2x^2 - y^2 + 6y$ *on the disk of radius 4,* $x^2 + y^2 \leq 16$.

References I

- VV285 slides from Horst Hohberger
- Paul's online note
  `https://tutorial.math.lamar.edu/Classes/CalcIII/AbsoluteExtrema.aspx`