Math 11, Fall 2007

Lecture 12

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10/22/07

Outline

Outline

Local Max/Min

- $$\nabla f = \vec{0}$$

  Critical points
- Second derivative test: the discriminant

$$D = f_{xx} f_{yy} - f_{xy}^2$$

provides classification information

Outline

Locating Max/Min values on a region

Often we want to find an *absolute* maximum or minimum of a function on a specified domain.

Example: Find the absolute max/min of $f(x, y) = x^2 + y^2$ on the rectangle $-1 \leq x \leq 1, 2 \leq y \leq 3$

Absolute Max/Min
Procedure

1. Find all critical points, discard those outside the region and evaluate the function on the rest
2. Parameterize the boundary (perhaps in multiple parts)
3. Restrict the function to the boundary and find all extreme values on the boundary
4. Pick the largest and smallest of the remaining values

Example: Find the absolute max/min of $f(x, y) = x^2 + y^2$ on the rectangle $-1 \leq x \leq 1, 2 \leq y \leq 3$

Outline

Examples

- $f(x, y) = 1 + 4x - 5y$, D is the closed triangular region with vertices $(0, 0), (2, 0), (0, 3)$
- $f(x, y) = 2x^3 + y^4$, $D = \{(x, y) | x^2 + y^2 \leq 1\}$
- Find the points on the cone $z^2 = x^2 + y^2$ that are closes to the point $(4, 2, 0)$.

Work for next class

- Reading: 16.1
- f07hw13