

Math 12, Fall 2007

Lecture 12

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Outline

- 1 Review and overview
 - Last class
- 2 Today's material
 - Absolute Extremal values
 - Examples
- 3 Next class

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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

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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 $-1 \leq x \leq 1, 2 \leq y \leq 3$

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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 closest to the point $(4, 2, 0)$.

Work for next class

- Reading: 16.1
- f07hw13