

11.7 Maximum and Minimum Values

Local and Absolute Minima

Theorem (analogue of Fermat's Theorem)

Critical Points

Example 1

Let $f(x, y) = x^2 + y^2 - 6x - 4y + 15$. Find the critical points and identify whether they are maxima or minima.

Example 2

Find the extreme values of $f(x, y) = x^2 - y^2$.

Second Derivative Test

Example 3

Find the local maximum and minimum values and saddle points of $f(x, y) = x^4 + y^4 - 4xy$.

Example 4

Find the local maximum and minimum values and saddle points of

$$f(x, y) = 5 - 10xy - 4x^2 + 3y - y^4$$

Example 5

A rectangular box without a lid is to be made from 12 m^2 of cardboard. Find the maximum volume of such a box.

Extreme Value Theorem

Example 6

Find the absolute maximum and minimum values of $f(x, y) = 4x + 6y - x^2 - y^2$ on $D = \{(x, y), 0 \leq x \leq 4, 0 \leq y \leq 5\}$.