Math 105 Course Outline

Week 3

Overview

This week, we will go further into our explorations of maxima/minima of functions of two variables. In particular, we will study absolute maxima/minima (global maxima/minima) and we will learn a procedure to solve constrained optimization problems.

Learning Objectives

These learning objectives give a minimum understanding that is examinable. By the end of the week, you should be able to do all of the objectives below independently.

Ref	Learning Objective
03–01	Applications of partial derivatives

Objective 1: Give the definition of an absolute maximum/minimum of a function $f(x, y)$. See p. 858. [Recall]

Objective 2: Given a function $f(x, y)$ on a closed and bounded set in $\mathbf{R}^2$, calculate its absolute maximum/minimum values using the procedure outlined on p. 858 in the box. You are not responsible for finding absolute maxima/minima on open or unbounded sets p. 860. [Procedural]

Example problem: *Find the absolute maximum and minimum values of* $f(x, y) = x^2+y^2-2x+2y+5$ *on the set* $R = \{(x, y) : x^2+y^2 \leq 4\}$..

Reading: Text §12.8 (p. 858 – 859)

Practice problems: Text p. 861: *37 – 44*

Reading: Text §12.8 (p. 860)

Practice problems: Text p. 861: *49–52, 62*

03–02 Lagrange Multipliers

Objective 1: Be able to describe constrained optimization with the terms *objective function* and *constraint*. [Recall]

Objective 2: Be able to describe the notation $\nabla f =< f_x, f_y >$ used for the gradient vector of a function, and compute it for a given function $f(x, y)$ in two variables. [Familiarity with Notation and Terminology]

Objective 3: Given a constrained optimization problem in two variables, use the method of Lagrange Multipliers given in the box on p. 865 to solve the constrained problem. You will not need to consider more than 2 variables (i.e. ignore Lagrange Multipliers with Three Independent Variables beginning on p. 867). [Procedural]

Example problem: *Find the maximum and minimum values of the objective function* $f(x, y) = 2x^2 + y^2 + 2$, *where* x *and* y *lie on the ellipse* $\mathcal{C}$ *given by* $g(x, y) = x^2 + 4y^2 - 4 = 0$.

Reading: Text §12.9 (p. 864-866, 868-869[1])

Practice problems: Text p. 869: *1 – 2, 4, 5 – 10, 20 – 21, 38 – 41, 45 – 47*

Notes: 1) On p. 868-869 you are only responsible for the section on Economic Models.