Math 8: Calculus in one and several variables
Winter 2019 - Homework 9

Return date: not collected

keywords: *absolute maxima and minima, Lagrange multipliers*

exercise 1. The base B of an aquarium (without lid) is made of slate and the four sides are made out of glass. The volume of the aquarium is V. If slate costs five times as much as glass (per unit area), find the dimensions of the aquarium that minmize the cost of the material.

a) Find the minimum using the methods from Chapter 14.7 of the book.

b) Verify your result from part a) using the method of Lagrange multipliers.

exercise 2. Find the dimensions of a box with volume $V = 1000\ cm^3$ that has minimal surface area.

a) Find or guess a solution using your geometric intuition.

b) Verify your result from part a) using the method of Lagrange multipliers.

exercise 3. Use the method of Lagrange multipliers to find the maximum and minimum of the function f subject to the given constraints

a) $f(x, y) = 3x + y$, if $x^2 + y^2 = 10$.

b) $f(x, y, z) = xy^2z$, if $x^2 + y^2 + z^2 = 4$.

exercise 4. Find the absolute maxima and minima of the function f in the region D.

a) $f(x, y) = 2x^2 + 3y^2 - 4x - 5$, where $D : x^2 + y^2 \leq 16$

b) $f(x, y, z) = x^2 + 2y^2 + 3z^2$, where $D : x + y + 3z = 10$.