

Math 8: Calculus in one and several variables
Spring 2017 - 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 minimize 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 $V = 1000 \text{ cm}^3$ 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 $D : x + y + 3z = 10$.
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