

Math 210 (Lesieutre)
12.9: Lagrange multipliers
February 28, 2017

Problem 1. You want to find a rectangle with perimeter 16 and area as large as possible.

a) Convert this into a constrained optimization problem: let x and y be the two sides of the rectangle. What function $f(x, y)$ are you trying to maximize? What constraint must be satisfied by x and y ?

b) Use the method of Lagrange multipliers to find the maximum value of the function.

Problem 2. Find the maximum value of the function $f(x, y) = y^2 - 4x^2$ subject to the constraint $g(x, y) = x^2 + 2y^2 = 4$.

Problem 3. Use Lagrange multipliers to find the point on the parabola $y = x^2 - 1$ which is closest to the origin.

Problem 4. You are making a open-top drawer out of wood. The material for the sides and back costs \$2 per square foot, and material for the bottom costs \$1, and the material for the front costs \$4.

a) Suppose that the dimensions of the drawer are x (side to side), y (top to bottom), and z (front to back). What is the total cost of the materials?

b) What are the dimensions of the cheapest drawer with volume 24 cubic feet?