Lagrange Multipliers II.

Fall 2015

Attendance Quizzes

October 14, 2015

Quiz 18 Lagrange Multipliers II.

We wish to build a shed with base of dimensions $x \times y$ feet and height z feet. The shed has a full back of dimensions $y \times z$ and two sides. In addition, there is an extended roof of dimensions $y \times 2x$. Answer the following:

1. Assume that we have 120 square feet of material available. Set up the equations for the Lagrange multiplier method to maximize the volume of the shed.
   Answer: The function to be maximized is $f(x, y, z) = xyz$. The constraint is $g(x, y, z) = 2xz + yz + 2xy - 120 = 0$. So the equations are: $yz = \lambda(2z + 2y, xz = \lambda(z + 2x), xy = \lambda(y + 2x), 2xz + yz + 2xy - 120 = 0$.

2. It is not necessary to solve the equations during the quiz. You should, however do it at home.
   Answer: Note that it is possible to deduce the max. value to be $\sqrt{40}$ even without finding x, y, z. The dimensions are $1/\sqrt{40}, 2/\sqrt{40}, 2/\sqrt{40}$