MATH 251   Maple Lab 4

Sections 22-24

March 11, 2015

You are encouraged to discuss this assignment with other students and with your instructors, but the work you hand in should be your own. The web page

`http://www.math.rutgers.edu/courses/251/Maple/Lab4/Optimization.html`

can help you with this assignment; to find it, follow the "Maple in Math 251" link on the the Math 251 course webpage.

A website will be posted listing individualized data for each student. For this lab, the data will consist of an inequality constraint, which implicitly defines a domain $\mathbb{D}$ in which the value of a certain *constraint function* is at most 1, and an *objective function*. Each of these two functions will be polynomials in four variables (w, x, y, and z). You are to find the maximum and minimum value of the objective function in the domain $\mathbb{D}$. You should report the max and min values you find and, for each, whether it occurs:

(i) at a critical point of the objective function within the interior of the domain $\mathbb{D}$, or

(ii) on the boundary of $\mathbb{D}$, where the constraint function has value exactly 1.

The objective function will have exactly one critical point, and you should report whether or not this point lies inside $\mathbb{D}$. Report also the number of points on the boundary of $\mathbb{D}$ given as candidates by the method of Lagrange multipliers.

> Please use some care in copying the constraint equation and objective function. Some of the formulas will be long and elaborate – this problem is *almost real*.

This assignment is due **April 9, 2015** in recitation.. Late submissions will *not* be accepted.

Please hand in a printout of all Maple instructions that you use. You must print out the assignment and hand it in to me.

○ All pages should be labeled with your name and section number. Also, please *staple* together all the pages you hand in.

○ **You should clean up your submission by removing the instructions that had errors.**

The work that you hand in should include:

1. A clear identification in your printout of the critical point of the objective function, together with a determination of whether or not this point lies in $\mathbb{D}$.

2. If the critical point does lie inside $\mathbb{D}$, a determination of the value of the objective function at that point.

3. A clear identification in your printout of the points on the boundary of $\mathbb{D}$ which are candidates for points where extrema are achieved. These points will be produced by using `Maple` to carry out the Lagrange multiplier method on your data, and you should show the necessary Maple instructions of this calculation. Be sure to declare explicitly how many different candidates (4-tuples of numbers) there are.

4. Explicit specification of the values of the objective function which are candidates for extreme values, arising from the critical point or from the boundary.

5. The actual maximum and minimum values of the objective function.