The due date for this lab will be provided by your lecturer or recitation instructor. Late submissions will not be accepted.

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

For helpful background material, see the web page
`https://sites.math.rutgers.edu/courses/251/Maple/Lab4/Optimization.html`

For this lab, the data will consist of an inequality constraint, which implicitly defines a domain $\mathcal{D}$ 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 $\mathcal{D}$. You should report the max and min values you find and, for each, whether it occurs:

- at a critical point of the objective function within the interior of the domain $\mathcal{D}$, or
- on the boundary of $\mathcal{D}$, 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 $\mathcal{D}$. Report also the number of points on the boundary of $\mathcal{D}$ 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.*

Instructions

- **Hand in a printout of your work. In this printout:**
  - Label all pages with your name and section number. Also, please *staple together* all the pages you hand in.
  - *Clean up your submission by removing the instructions that had errors.*
- **Include in the work that you hand in:**
  - 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 $\mathcal{D}$.
  - If the critical point does lie inside $\mathcal{D}$, a determination of the value of the objective function at that point.
  - A clear identification in your printout of the points on the boundary of $\mathcal{D}$ 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.
  - Explicit specification of the values of the objective function which are candidates for extreme values, arising from the critical point or from the boundary.
  - The actual maximum and minimum values of the objective function.