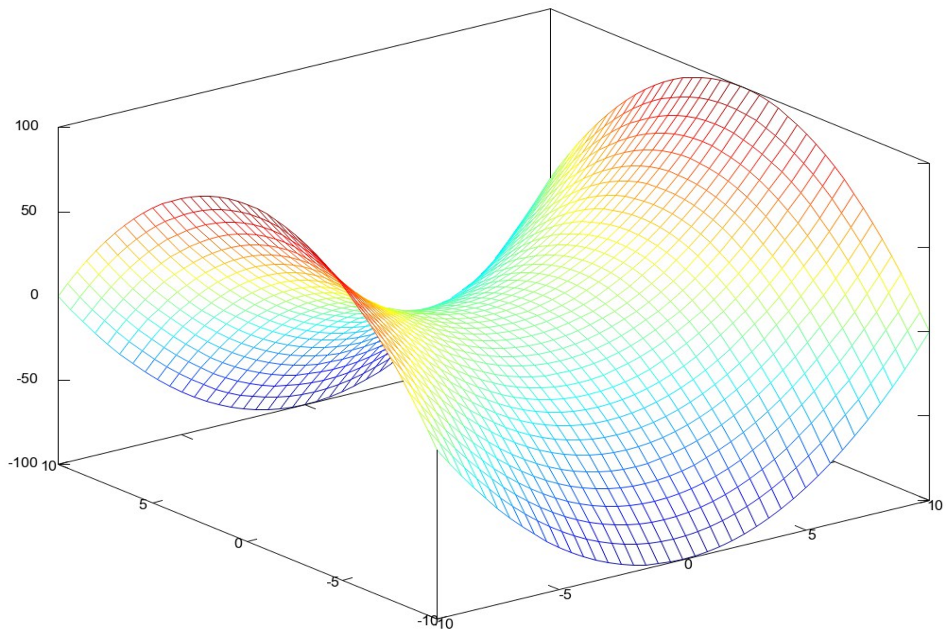
Question: Maximize $x^2 - y^2$ subject to the constraint $2x + y - 3 = 0$.

This is a supplement to the argument I gave in class on Wednesday 2/29, where I argued that the point $(2, -1)$ that we found using the Lagrange method was indeed a maximum. This is mostly to help you visualize the problem.

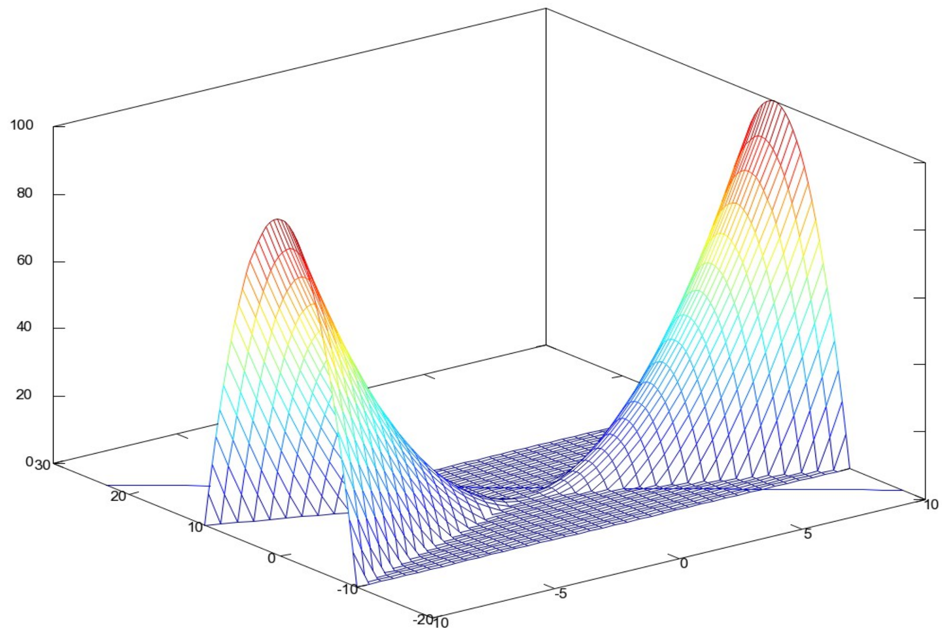
The following is a visualization [1] of the surface $z = x^2 - y^2$.



On the next page, I've changed things a little to show you how the constraint fits in.

[1]The graphics in this writeup were produced using GNU Octave.

I've suppressed the part of the surface below the $z = 0$ plane (that is, where the surface dips below "ground level"), and I've added the line $y = 3 - 2x$, which represents the constraint (it is the solid blue line in the base of the box).



By tracing along the constraint, you can see the point $(x, y) = (2, -1)$ that we found in class using the Lagrange method corresponds to a maximum of the value of $x^2 - y^2$. Over this point, the surface is "highest" over the blue constraint line.