

Bronx Community College of CUNY
Math 35 - Multivariable Calculus. Professor Luis Fernández
3D Printing Project: Graphs of Two-Variable Functions

Overview:

The purpose of this assignment is:

- To become familiar with graphs of functions of two variables and develop an intuition.
- To learn about the computer algebra software Mathematica and how you can get it for free (!) and use it in your courses.
- To learn some basics of 3D printing and be able to 'touch' a graph.

Instructions:

- Download mathematica in your computer (highly recommended). The university has a license, so it is free. Contact the IT department for instructions on how to download it. Alternatively use a computer on campus.
- Download the file 3Dgraph.nb from the green webpage: go to <http://fsw01.bcc.cuny.edu/luis.fernandez01/> and click on MATH 33. Save it in your computer with the name "3Dgraphnameofgroup.nb". So if your group's name is "newton", use "3Dgraphnewton.nb". Open the file in Mathematica and follow the instructions on the file.
- Play with different functions and look at their graph. Change the function until you decide what graph to print in 3D. You will have to explain to the class why you chose that graph in particular, so make sure to make a good choice!
- Once you decide which graph to print, follow the instructions in the Mathematica file to export the graph into a file with the extension .stl. Then send me an email with the file attached. Make sure to remember the formula for the function you graphed.
- I will print your graph in a 3D printer, as in the pictures below. You will need to write the formula for the function in a sticker and stick it on the pedestal of the function.
- Once all the graphs are ready, I will give it back to you for study. You will need to identify where the axes are and be able to draw some sections of the graph in order to explain the shape of the graph.
- We will meet in class and each group will have to explain why they chose that function and how the formula of the function and the shape of the graph are related by taking sections. Then the class will vote which of the graphed functions looks more interesting.

Notes:

Mathematica is one of the leading computer algebra software used nowadays in industry, academia, and research. It has enormous capabilities (it can give you immediately any humanly doable integral you want, for example). Try to use it for this course and for any other courses you take. Familiarity with Mathematica will be a great asset when you apply for internships, transfers, or jobs.

```
In[1]:= f[x_, y_] = x^2 - y^2;  
graph = ParametricPlot3D[{r Cos[t], r Sin[t], f[r Cos[t], r Sin[t]]},  
  {r, 0, 1.5}, {t, 0, 2 Pi}, PlotStyle -> Thickness[.1]]
```

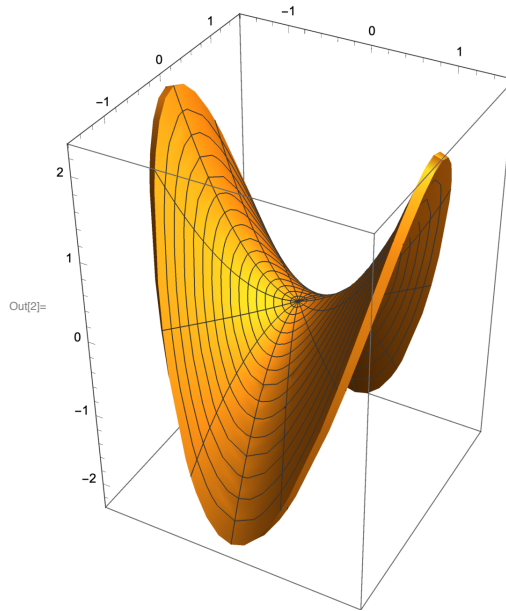


Figure 1: What you get with Mathematica



Figure 2: The final product that will be printed in 3D



Figure 3: **Photograph of final product**