GUIDE TO CREATING THE STL FILES FOR THE SURFACES

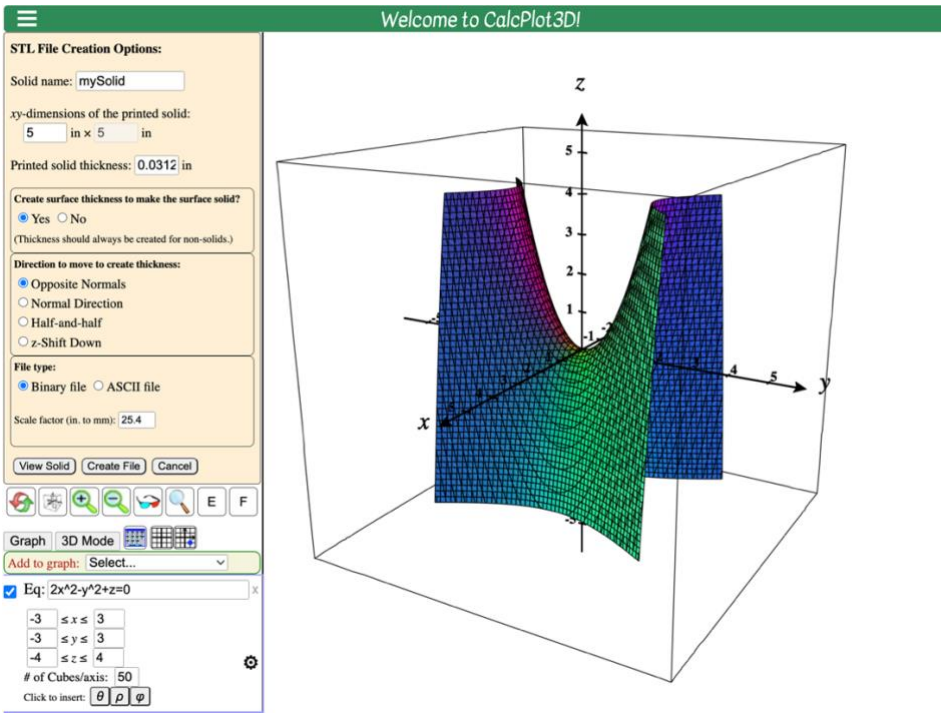
CREATE STL FILES IN CALCPLOT3D

Use the online graphing calculator CalcPlot3D to create your objects. Then follow the instructions below to create the STL file required for 3D printing.

Instructions:

1. Create the surfaces you want to print or use the links given below to load the surfaces already created.*
2. Toggle on the surface(s) that you want to include in the file.
3. Select *Menu -> File -> Create an STL file from the plot*.
4. Name the file and set the dimensions.*
5. Select *Create File.*

*See section below for the settings used for these surfaces.



PRINTING THE SURFACES

Once you have the STL files, you are ready to send it to the 3D printer. Using the above settings and the surfaces describes below, you will want to

SCALE THE OBJECTS BY 72%

to create final products that are just under 6 inches (including the stands). Keep in mind that scaling the objects changes the thickness proportionally.

You may want to download the 3D printing software and printer profile the printer will be using (e.g. Cura). This software will allow you to estimate the amount of material used for each print.

RECOMMENDED SETTINGS FOR THE SURFACES

1. Settings for axes:
    a. *x,y,z* axes range from -5 to 5
    b. *x,y,z* tick and scalefactors all set to 1
    c. lower/upper *z*-clip set to 4
    d. Focus point (0,0,0)
2. Settings used for exporting as an STL file:
    a. *xy*-dimensions of printed solid: **5 in x 5 in**
    b. Printed solid thickness: **0.03125 in**
    c. Keep the rest of the default settings: Yes, Opposite Normals, Binary file, 25.4

CYLINDERS

Link to view the surfaces in CalcPlot3D: CalcPlot3D_Cylinders

Surface	Equation
Elliptic Cylinder	2x^2 + y^2 = 4
Parabolic Cylinder	y^2 + z = 4
Hyperbolic Cylinder	2x^2 - y^2 = 4

QUADRIC SURFACES

Link to view the surfaces in CalcPlot3D: CalcPlot3D_Quadric

Surface	Equation
Paraboloid	2x^2 + y^2 + z = 4
Ellipsoid	x^2/4 + y^2/9 + z^2/16 = 1
Hyperbolic Paraboloid	2x^2 - y^2 + z = 0
Hyperboloid of Two Sheets	2x^2 + y^2 - 0.5z^2 = -0.5
Cone	2x^2 + y^2 - 0.5z^2 = 0
Hyperboloid of One Sheet	2x^2 + y^2 - 0.5z^2 = 2

SUPPORT STRUCTURES/STANDS (TRANSPARENT)

The transparent stands for the cone and hyperboloid of two sheets did not end up being transparent enough for my intended purposes. Instead, I recommend using the printed stands as a template and cut out stands from transparencies. Then I used glue to secure the transparencies to the models (be aware that some glue will result in a cloudy finish from off-gassing).

Link to view the surfaces in CalcPlot3D: CalcPlot3D_Stands

Description	Equation
Stand for ellipsoid	x^2/4 + y^2/9 + 3^2/16 = 1
Stand for cone	2x^2 + y^2 - 0.5(2^2) = 0
Stand for hyperboloid of two sheets	2x^2 + y^2 - 0.5(2^2) = -0.5
Hyperbolic cylinder stand	y = +/- 1.3x, box [-0.5, -1.3/2] x [0.5, 1.3/2]

PREVIEW SURFACES WITH STANDS

Below are links to view the *final* surfaces including the stands in CalcPlot3D:

Hyperbolic Cylinder with stand, Hyperboloid of two sheets with stand, Ellipsoid with stand, Cone with stand

NEED HELP?

Contact Athena Sparks Pelfrey at athena.s.pelfrey@gmail.com.