

# GUIDE TO CREATING THE STL FILES FOR THE SURFACES

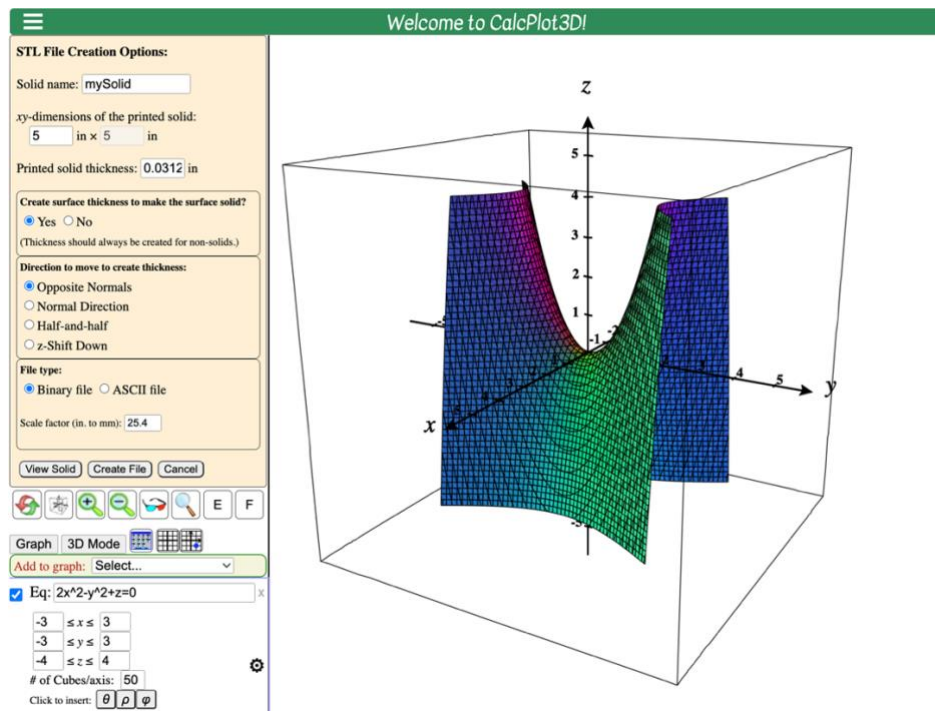
## CREATE STL FILES IN CALCPlot3D

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)

Link to view the surfaces in CalcPlot3D: [CalcPlot3D Stands](#)

Description	Equation
Stand for ellipsoid	$x^2/4 + y^2/9 + 3z^2/16 = 1$
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	$y = \pm 1.3x$ , box $[-0.5, -1.3/2] \times [0.5, 1.3/2]$

## 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](mailto:athena.s.pelfrey@gmail.com).