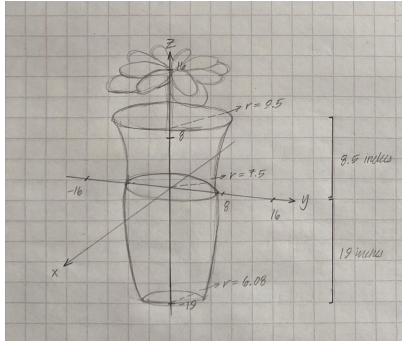# Math 254 Project | The Vase With Flower

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Abby Garcia, Lia Mar-Lundeen, Anastasia Puchkarev

Diagram of The Vase With Flower

Equations

The hyperboloid of one sheet for the top portion of the vase equation

$$\frac{x^2}{7.5^2} + \frac{y^2}{7.5^2} - \frac{z^2}{9.5^2} = 1 \text{ with } 0 \leq z \leq 8.5$$

The ellipsoid for the bottom portion of the vase equation

$$\frac{x^2}{7.5^2} + \frac{y^2}{7.5^2} + \frac{z^2}{37^2} = 1 \text{ with } -19 \leq z \leq 0$$

The flower
a=9
0≤ u≤ 2pi , number of steps: 30
0≤ u≤ pi , number of steps: 15
x(u,v)=acos(4v)cos(u)^8cos(v)cos(u)
y(u,v)=acos(4v)cos(u)^8sin(v)cos(u)
z(u,v)=15+acos(4v)cos(u)^8sin(u)

Height of flower is 15 inches, 8 petals

Stem flower
x^2+y^2=1

The leaves
0≤u≤pi , number of steps: 40
-1≤v≤1 , number of steps: 3
x(u,v)=(20v*sin(u)*cos(u)*cos(u))
y(u,v)=(25v*sin(u))*cos(u)*sin(u))
z(u,v)=13+v*cos(u)

Reflection
The most exciting part of this project was trying out a program that has the ability to paint everything in 3D. It was very interesting seeing the dimensions pop off of the screen and creating new objects that were intricate. The most difficult thing was to get the shapes to be a specific way. For example overlapping, or bigger, smaller etc, the miniscule details were the hardest part. But in all it was a cool experience and I can take this experience with future engineering, or maybe physics classes.

Plotting
the hyperboloid
$x^2/7.5^2 + y^2/7.5^2 - z^2/9.5^2 = 1$ with $0 \leq z \leq 8.5$

the ellipsoid $\frac{x^2}{7.5^2} + y^2/7.5^2 + z^2/37^2 = 1$

with $-19 \leq z \leq 0$,
and our flower on CalcPlot3D, we get the following figure: