

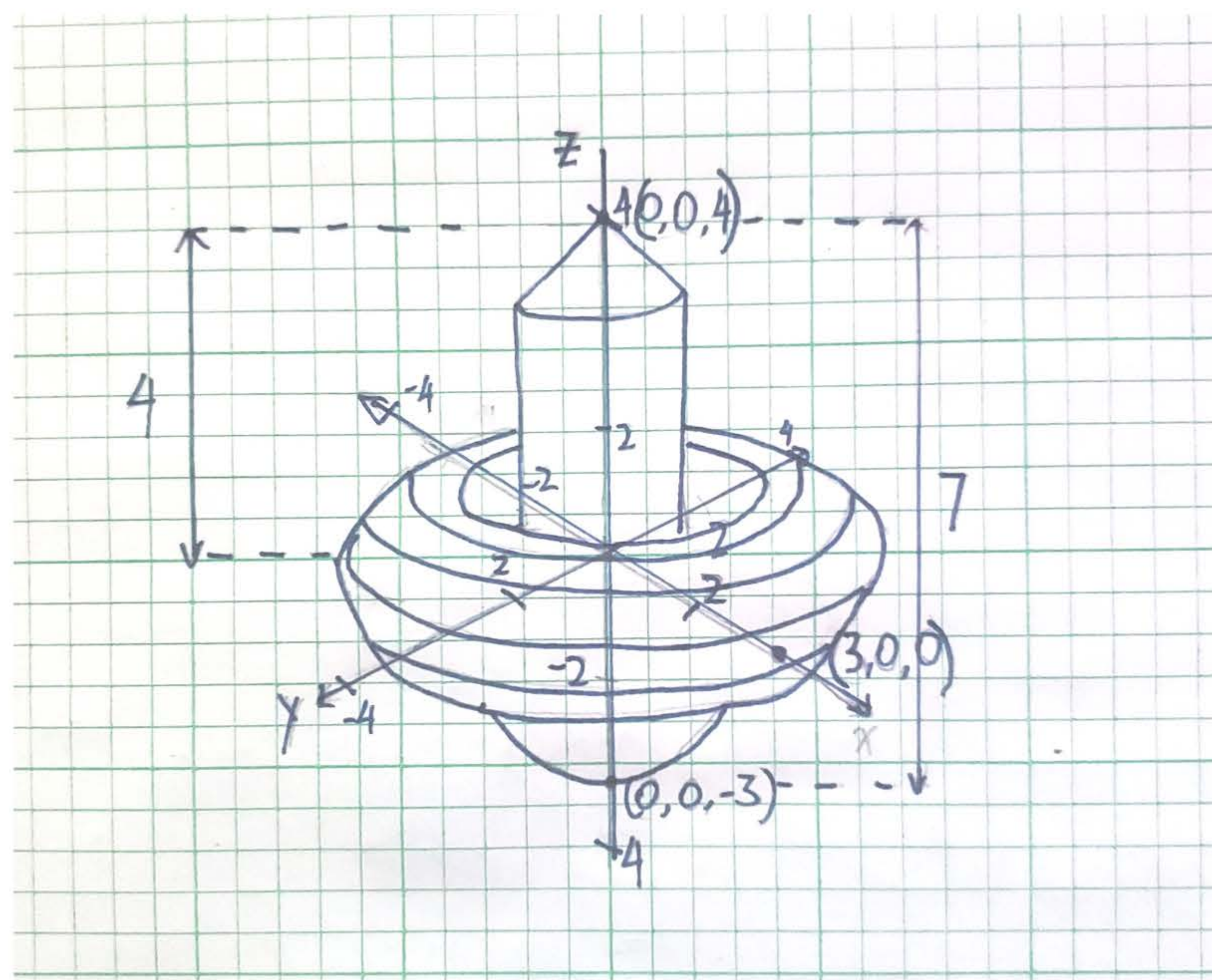
MATH&254 FINAL PROJECT

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Modeling A Real Object "THE TOP"



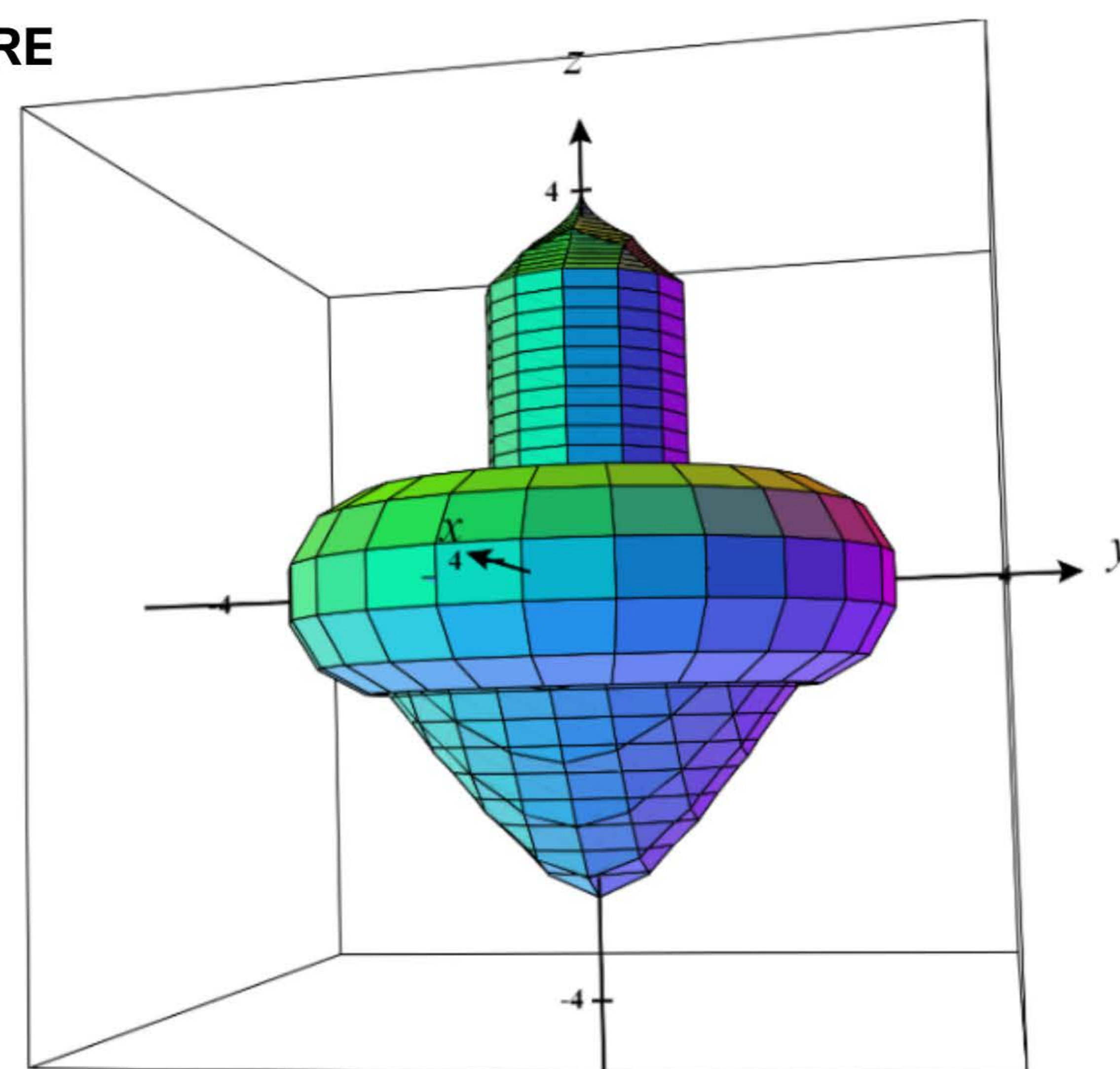
INTRODUCTION The object we chose to model is a top. The purpose of this project is to gain familiarity with using online graphing tools to visualize 3D shapes and connect math equations with 3D shapes in real life. In this project we use quadratic surfaces to rebuild our object in CalcPlot3D.

MANUAL SKETCH On the left is the sketch of our diagram. Measuring out all of the individual sections of our top, we were able to construct this top with the correct parameters to be proportional in our equations.

MATH EQUATIONS

- The cone on the tip of the top's handle can be described by $x^2 + y^2 = (z - 4)^2$ with $3 \leq z \leq 4$.
- The cylinder that makes up the handle of the top can be described by $x^2 + y^2 = 1$ with $0 \leq z \leq 3$.
- The torus that makes up the body of the top can be described as $x(u,v) = (2 + \cos(v))\cos(u)$, $y(u,v) = (2 + \cos(v))\sin(u)$, $z(u,v) = \sin(v)$ with $-4 \leq u \leq 4$, $-4 \leq v \leq 4$.
- Finally, the cone that makes up the bottom of the top can be described as $2x^2 + (2y^2) + 1 = (z + 4)^2$ with $-4 \leq z \leq 0$.

FINAL FIGURE



CONCLUSION

The most exciting thing about this project was that we were able to take our knowledge of math from the past quarter and finally put it to use into something we were able to create on our own, outside of homework problems and tests. With the subject skills we learned in class, we were able to make our creativity come to life, in 3D! We really enjoyed being able to learn how to use the software, CalcPlot3D, as none of us have used it in the past before. Additionally, we learned about the torus and the equation we could use to graph it for the top.

The most challenging thing about this project was learning how to use the software, and collaborating ideas we had from person to person virtually. The object we chose, we wanted to match exactly as the photo, and we worked hard to make sure every individual quadratic surface lined up together to create one fully formed figure. Through trial and error, and experimenting with different values, we collaborated and played around with the software until we were able to come together and build a top that we were all proud of.

As all three of us are planning to continue down the path of mathematics and take a higher-level math class in the future, and this project has helped us realize the far reaches of math in the real world. Every object we encounter in real life is made up of a series of quadratic surfaces, and with this project, it is cemented into our heads what the equations that make them up are. With a large project like this, we found the value of groupwork and collaboration and will take it with us to future group projects.