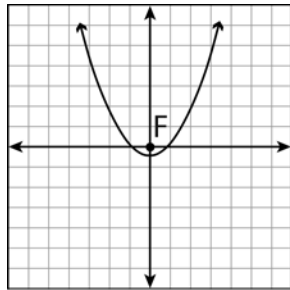


# Cutting Conics

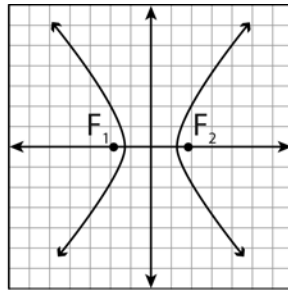
NAME \_\_\_\_\_

In this exploration, you will discover the different cross sections created by cutting a double-napped cone with a plane. A double-napped cone is made when two solid cones are connected at their vertices. The point where the vertices touch is called the *origin* because the point would be at the origin if the double-napped cone was in a three-dimensional Cartesian coordinate system.

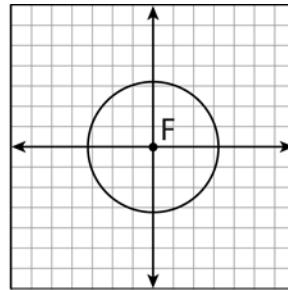
You will discover ways to create each of the following shapes:



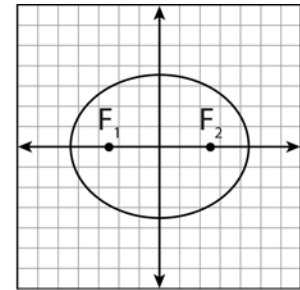
Parabola



Hyperbola



Circle



Ellipse

Double-napped cones can vary by height and slant. Experiment with changing these parameters as you work through the exploration. The plane creating the cross section can vary by slope ( $m$ ) and distance from the origin ( $b$ ) in relation to the double-napped cone. As you cut your cones, you need to note these characteristics of the cut. Try to answer these questions as you work:

- For slope ( $m$ ): How does the cut relate to the base and side of the cone? Is it parallel? perpendicular? neither?
- For relative distance from the origin ( $b$ ): Is the plane close to the origin or far? What happens when you move the cut farther from or closer to the origin?

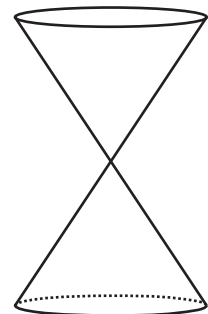
For each conic section, sketch the plane and cross section needed to create it. Then, answer the questions about that conic. Try creating each shape in different ways by varying the parameters.

## The Circle

1. What are the characteristics of the plane used to create the circle?

2. What happens when the plane is closer to the origin?

sketch:



3. What other observations can you make about creating circles?

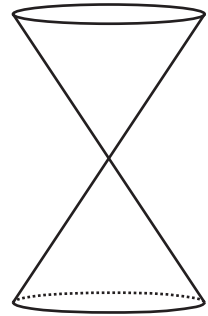
### The Ellipse

4. What are the characteristics of the plane used to create the ellipse?

5. What happen when the plane is at the same angle but closer to the origin?

6. What other observations can you make about creating ellipses?

sketch:

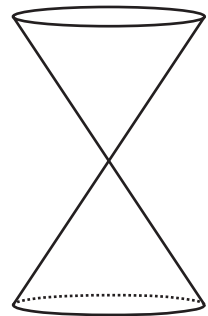


### The Hyperbola

7. What are the characteristics of the plane used create the hyperbola?

8. What happen when the plane is at the same angle but closer to the origin?

sketch:



9. What happens when the plane is at a different angle?

10. What other observations can you make about creating hyperbolas?

### The Parabola

11. What are the characteristics of the plane used to create the parabola?

12. What happens when the plane is at the same angle but closer to the origin?

13. What other observations can you make about creating parabolas?

sketch:

