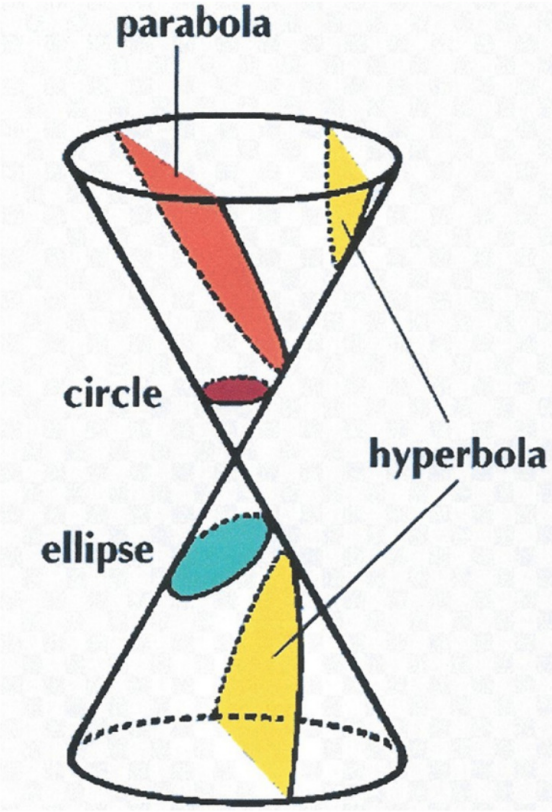
# Unit 5
# Day 5 - Applications

## Objective:

- Use conic equations and characteristics of conics to solve real world application problems.

# Applications!




**Applications of Parabolas:**

- Path of thrown objects
- Satellite Dishes
- Headlights
- Suspension Bridges
- NC State Wolf Ears

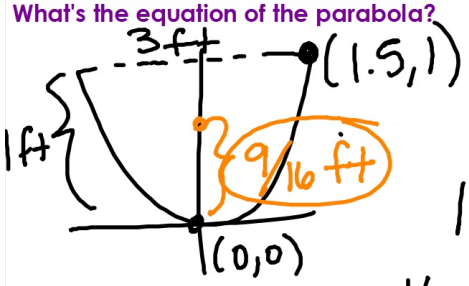
https://www.youtube.com/watch?v=bSlHewU0hfQ

## Application Problem:

On the sidelines of each of its televised football games, networks use a **parabolic** reflector with a microphone at the reflector's focus to capture the conversations among players on the field. If the parabolic reflector is 3 ft across and 1 ft deep, where should the microphone be placed?

**What are we solving for?** focus

**What's the equation of the parabola?**




$y = \frac{1}{4c}x^2$

$1 = \frac{1}{4c}\left(\frac{3}{2}\right)^2$

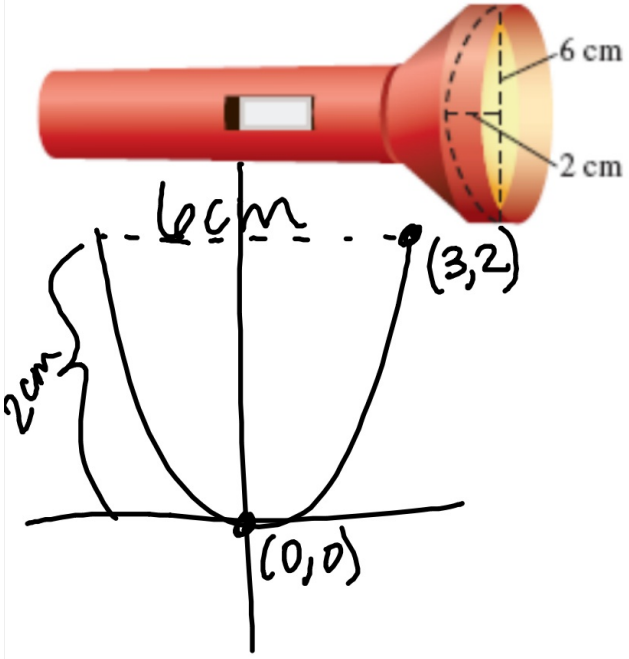
$1 = \frac{4}{4c}\left(\frac{9}{4}\right)$

$1 = \frac{9}{16c}$

$16c = 9$

$c = \boxed{\frac{9}{16}\text{ ft}}$

**The mirror of a flashlight is a paraboloid of revolution.**
**Its diameter is 6 cm and its depth is 2 cm.**
**How far from the vertex should the filament of the light bulb be placed in order for it to be situated at the mirror's focus?**




$y = \frac{1}{4c}x^2$

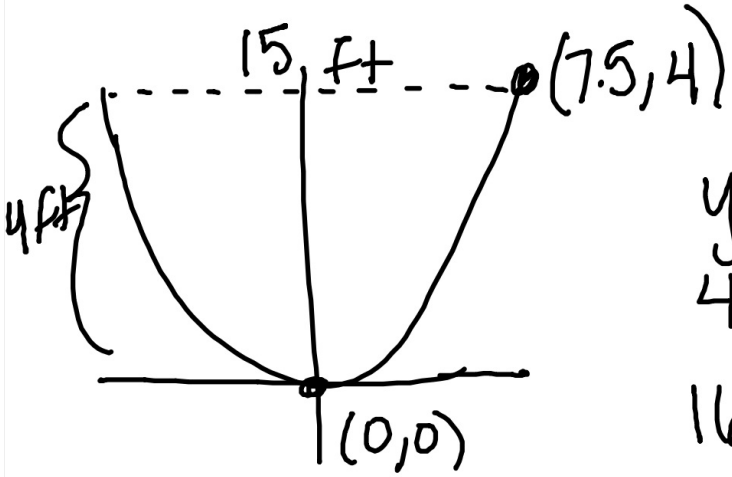
$2 = \frac{1}{4c}(3)^2$

$2 = \frac{9}{4c}$

$8c = 9$

$c = \boxed{\frac{9}{8}\text{ cm}}$

**A satellite dish has a parabolic cross-section. The dish is 15 ft. wide at the opening and the depth is 4 ft. determine how far the light source is from the deepest part of the dish, if the light source is placed at the dish's focus.**



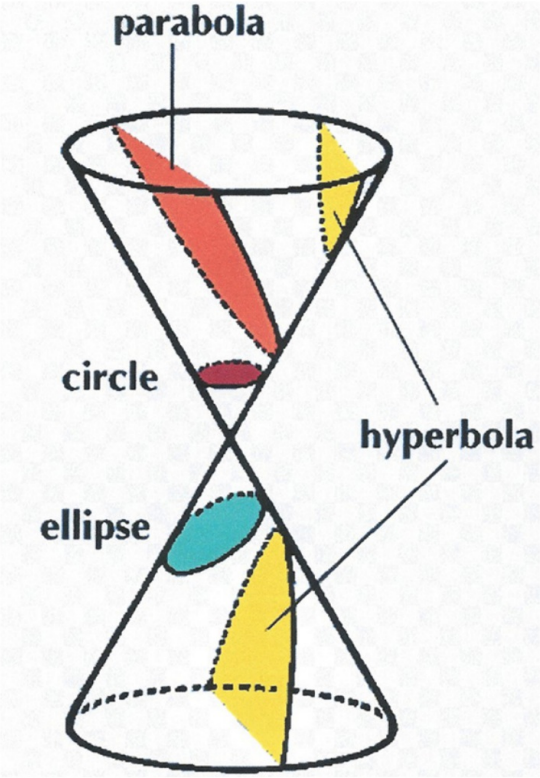

$$y = \frac{1}{4c}x^2$$

$$4 = \frac{1}{4c}(7.5)^2$$

$$16c = 56.25$$

$$c = \frac{56.25}{16} = 3.52 \text{ ft}$$

# Applications!



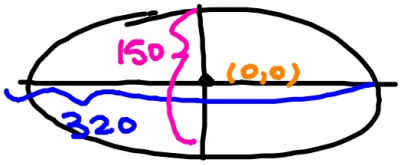

## Applications of Ellipses:

- Planets and the moon travel in elliptical orbits
- One of the most popular curves to be seen - every time you look at a circular figure at an angle the curve you see is an ellipse

## Application Problem:

**A listener is standing in an elliptical room 150 feet wide and 320 feet long. When a speaker stands at one focus and whispers, the best place for the listener to stand is at the other focus.**

**a. Write an equation to model this ellipse, assuming the major axis is horizontal and the center is at the origin.**




$$\frac{x^2}{160^2} + \frac{y^2}{75^2} = 1$$

**b. How far apart should the speaker and the listener be in this room?**

$$c^2 = 160^2 - 75^2$$

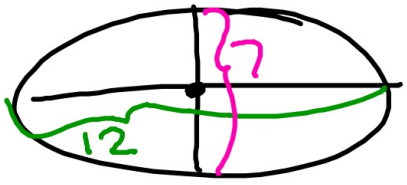
$$c = 141.33$$

$$2c = \boxed{282.67 \text{ ft}} \text{ apart}$$

**A fishing pond is in the shape of an ellipse. The length of the pond is 12 ft and the width is 7 ft.**

**a. Find an equation for the pond.**

$$\frac{x^2}{6^2} + \frac{y^2}{3.5^2} = 1$$




**b. Determine the exact distance between the "foci" of the pond.**

$$c^2 = a^2 - b^2$$

$$c^2 = 36 - 12.25$$

$$c^2 = 23.75$$

$$c = \sqrt{23.75}$$

$$2c = 2\sqrt{23.75}$$

$$= \boxed{9.75 \text{ ft}}$$