HA2T

9.4 Worksheet Conics Application

Name: Key

1. A satellite dish is shaped like a paraboloid of revolution. The signals that emanate from a satellite strike the surface of the dish and are reflected to a single point, where the receiver is located. If the dish is 10 feet across at its opening and is 4 feet deep at its center, at what position should the receiver be placed? (In other words, find the focus.)

$4p(y-k) = (x-h)^2$

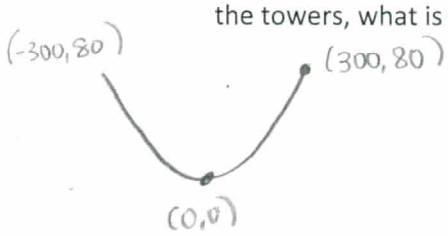
$4py = x^2$

$4p \cdot 4 = 5^2$

$p = 1.5625$

1.5625 feet from vertex (base of dish)

2. The cables of a suspension bridge are in the shape of a parabola. The towers supporting the cable are 600 feet apart and 80 feet high. If the cables touch the road surface midway between the towers, what is the height of the cable at a point 150 feet from the center of the bridge?



$4p(y-k) = (x-h)^2$

$4py = x^2$

$4p(80) = 300^2$

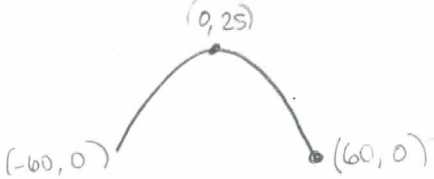
$p = 281.25$

$1125y = (x)^2$

$1125y = (150)^2$

$y = 20$ ft

3. A bridge is built in the shape of a parabolic arch (opening down). The bridge has a span of 120 feet and a maximum height of 25 feet. Find the height of the arch at 30 feet from the center.



$4p(y-25) = x^2$

$4p(-25) = 60^2$

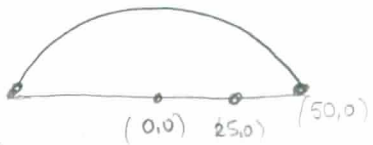
$p = -36$

$-144(y-25) = x^2$

$-144(y-25) = 30^2$

$y = 18.75$ ft

4. In a whispering gallery, a person standing at one end of the focus of the ellipse can whisper and be heard by another person standing at the other focus, because all the sound waves that reach the ceiling from one end are reflected to the other focus. A hall 100 feet in length is to be designed as a whispering gallery. If the foci are located 25 from the center, how high will the ceiling be at the center?



$$\frac{x^2}{50^2} + \frac{y^2}{(r_y)^2} = 1$$

$r_f = 25$

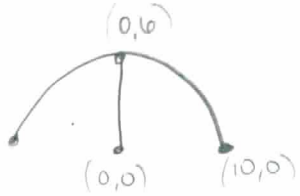
$r_x = 50$

$r_y =$

$25^2 = 50^2 - (r_y)^2$

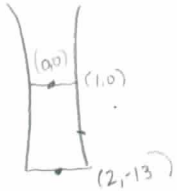
$r_y = 43.3$ ft

5. An arch in the shape of the upper half of an ellipse is used to support a bridge that is to span a river 20 meters wide. The center of the arch is 6 meters above the center of the river. Write an equation for the ellipse in which the *x*-axis coincides with the water level and the *y*-axis passes through the center of the arch.



$$\frac{x^2}{100} + \frac{y^2}{36} = 1$$

6. A sculpture is in the shape of a hyperboloid. The structure is 4 feet wide at the base, 2 feet wide at its narrowest point which is 13 feet off the ground and 32 feet tall. What is the width of the structure five feet from the ground?



$$\frac{x^2}{1} - \frac{y^2}{(r_y)^2} = 1$$

$$\frac{2^2}{1} - \frac{(-13)^2}{(r_y)^2} = 1$$

$$4 - \frac{169}{(r_y)^2} = 1$$

$56.33 = (r_y)^2$

$$\frac{x^2}{1} - \frac{y^2}{56.33} = 1$$

$$x^2 - \frac{(-8)^2}{56.33} = 1$$

$x^2 = 2.136$

$x = 1.46$

width is 2.92 ft