

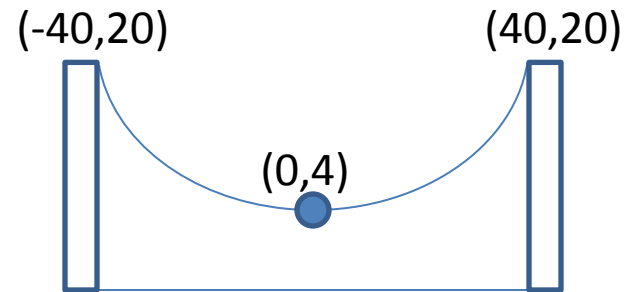
Parabola Applications

The main cables of a suspension bridge are 20 meters above the road at the towers and 4 meters above the road at the center. The road is 80 meters long. Vertical cables are spaced every 10 meters. The main cables hang in the shape of a parabola. Find the equation of the parabola. Then, determine how high the main cable is 20 meters from the center.

$$y = a(x - h)^2 + k$$

$$y = a(x - 0)^2 + 4$$

$$y = ax^2 + 4$$



$$20 = a(40)^2 + 4$$

$$20 = 1600a + 4$$

$$16 = 1600a$$

$$a = \frac{1}{100}, \quad y = \frac{1}{100}x^2 + 4$$

$$y = \frac{1}{100}x^2 + 4$$

$$y = \frac{1}{100}(20)^2 + 4$$

$$y = 8 \text{ feet}$$

The cable is 8 feet above the road.

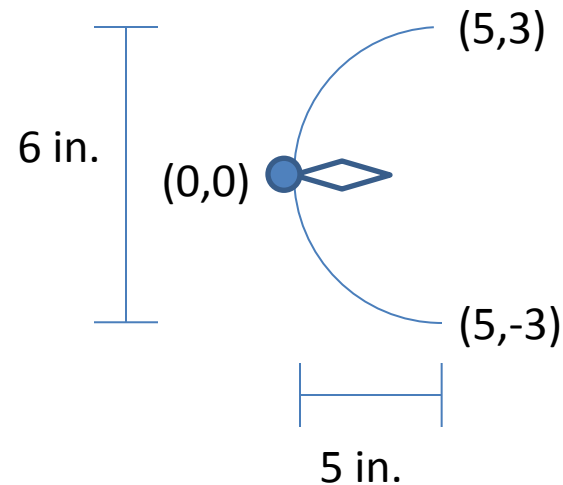
A car headlight mirror has a parabolic cross section with diameter of 6 in. and a depth of 5 in. How far from the vertex should the bulb be positioned if it is to be placed at the focus?

$$x = a(y - k)^2 + h$$
$$x = a(y - 0)^2 + 0$$
$$x = ay^2$$

$$5 = a(3)^2$$
$$5 = 9a$$
$$a = \frac{5}{9}, \quad x = \frac{5}{9}y^2$$

$$a = \frac{1}{4p}$$
$$\frac{5}{9} = \frac{1}{4p}$$
$$20p = 9$$
$$p = \frac{9}{20} = 0.45$$

The bulb should be placed 0.45 in from the vertex.



The outer door of an airplane hangar is in the shape of a parabola. The door is 120 feet across and 90 feet high. Find an equation describing the door's shape. If you are 6 feet tall, how far must you stand from the edge of the door to keep from hitting your head?

$$y = a(x - h)^2 + k$$

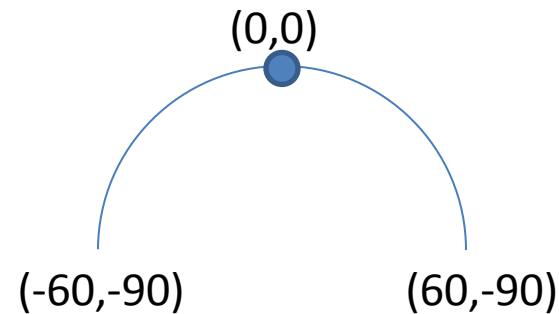
$$y = a(x - 0)^2 + 0$$

$$y = ax^2$$

$$-90 = a(60)^2$$

$$-90 = 3600a$$

$$a = \frac{-1}{40}, \quad y = \frac{-1}{40}x^2$$



$$-84 = \frac{-1}{40}x^2$$

$$3360 = x^2$$

$$x = 57.966$$

$$60 - 57.966 = 2.034$$

You must stand 2.034 ft from the edge.