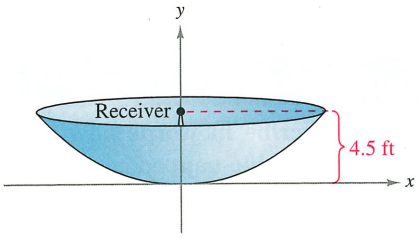
75. ***Satellite Antenna*** The receiver in a parabolic television dish antenna is 4.5 feet from the vertex and is located at the focus (see figure). Find an equation of a cross section of the reflector. (Assume that the dish is directed upward and the vertex is at the origin.)



76. ***Suspension Bridge*** Each cable of a suspension bridge is suspended (in the shape of a parabola) between two towers that are 120 meters apart and whose tops are 20 meters above the roadway. The cables touch the roadway midway between the towers.

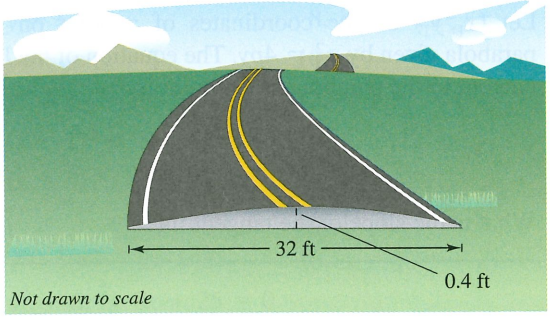
(a) Create a sketch of the bridge. Draw a rectangular coordinate system on the bridge with the center of the bridge at the origin. Identify the coordinates of the known points.

(b) Find an equation for the parabolic shape of each cable.

(c) Complete the table by finding the heights y of the suspension cables over the roadway at distances of x meters from the center of the bridge.

x	0	20	40	60
y				

77. ***Road Design*** Roads are often designed with parabolic surfaces to allow rain to drain off. A particular road that is 32 feet wide is 0.4 foot higher in the center than it is on the sides (see figure).



Cross section of road surface

(a) Find an equation of the parabola that models the road surface. (Assume that the origin is at the center of the road.)

(b) How far from the center of the road is the road surface 0.1 foot lower than in the middle?

78. ***Path of a Projectile*** The path of a softball is given by the equation

$$y = -0.08x^2 + x + 4.$$

The coordinates x and y are measured in feet, with $x = 0$ corresponding to the position from which the ball was thrown.

(a) Use a graphing utility to graph the trajectory of the softball.

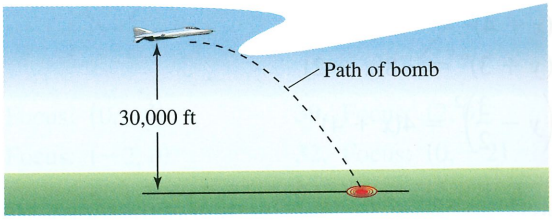
(b) Move the cursor along the path to approximate the highest point. Approximate the range of the trajectory.

(c) Analytically find the maximum height of the softball.

79. ***Projectile Motion*** A bomber is flying at an altitude of 30,000 feet and a speed of 540 miles per hour. When should a bomb be dropped so that it will hit the target if the path of the bomb is modeled by

$$y = 30{,}000 - \frac{x^2}{39{,}204},$$

where x is measured in feet?



80. ***Distance*** Find the point on the graph of $y^2 = 6x$ that is closest to the focus of the parabola.

Area **In Exercises 81–86, find the area of the region bounded by the graphs of the given equations.**

81. $x^2 = 2y, \quad y = 3$

82. $x^2 = 4(y - 1), \quad y = 10$

83. $y^2 = 4x, \quad x = 5$

84. $y^2 = -4(x + 1), \quad x = -5$

85. $(x - 2)^2 = 4y, \quad x = 0, \quad x = 4, \quad y = 0$

86. $(x + 1)^2 = -8(y - 2), \quad y = 0$

True or False? **In Exercises 87 and 88, determine whether the statement is true or false. If it is false, explain why or give an example that shows it is false.**

87. It is possible for a parabola to intersect its directrix.

88. If the vertex and focus of a parabola are on a horizontal line, then the directrix of the parabola is vertical.