2.3 Conic Parabolas

Practice Tasks

I. Concepts and Procedures

1. A parabola is the set of all points in the plane that are equidistant from a fixed point called the _____ and a fixed line called the_____ of the parabola.

2. The graph of the equation $y^2 = 4px$ is a parabola with focus F(_____, _____) and directrix $x =$ _____ . So the graph of $y^2 = 12x$ is a parabola with focus F (_____, _____) and directrix $x =$ _____.

3. Find the focus, directrix and focal diameter of the parabola and sketch the graph:

   a. $x^2 = 9y$

   b. $y^2 = 4x$

   c. $x^2 + 6y = 0$

   d. $5x + 3y^2 = 0$

4. Find an equation for the parabola that has its vertex at the origin and satisfies the given condition(s).

   a. Focus $F(0,2)$

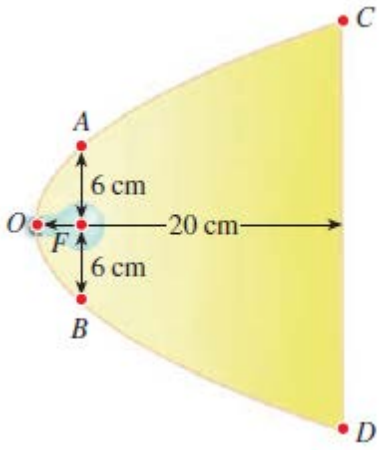
   b. Directrix $x=2$

   c. Focus on the positive x-axis, 2 units away from the directrix

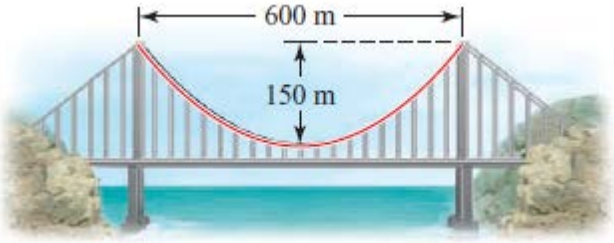
   d. Opens upward with focus 5 units from the vertex

II. Problem Solving

1. **Parabolic Reflector**: A lamp with a parabolic reflector is shown in the figure. The bulb is placed at the focus, and the focal diameter is 12 cm.
   a. Find an equation of the parabola.
   b. Find the diameter of the opening, 20 cm from the vertex.



2. **Suspension Bridge**: In a suspension bridge the shape of the suspension cables is parabolic. The bridge shown in the figure has towers that are 600 m apart, and the lowest point of the suspension cables is 150 m below the top of the towers.
   a. Find the equation of the parabolic part of the cables, placing the origin of the coordinate system at the vertex. [*Note*: This equation is used to find the length of cable needed in the construction of the bridge.]



III. Reasoning

1. Find equations for the family of parabolas with vertex at the origin and with directrices $y = \frac{1}{2}$, $y = 4$, and $y = 8$.
   Draw the graphs. What do you conclude?