

# Assignment

## Write

- locus of points
  - parabola
  - focus
  - directrix
  - general form of a parabola
  - standard form of a parabola
  - vertex of a parabola
  - concavity
- $Ax^2 + Dy = 0$  or  $By^2 + Cx = 0$
  - $x^2 = 4py$  or  $y^2 = 4px$
  - describes the orientation of the curvature of the parabola
  - a set of points in a plane that are equidistant from a fixed point and a fixed line
  - The maximum or minimum point of a parabola
  - a set of points that share a property
  - the fixed point from which all points of a parabola are equidistant
  - the fixed line from which all points of a parabola are equidistant

## Remember

A parabola is the set of all points in a plane that are equidistant from a fixed point, the focus, and a fixed line, the directrix. A parabola has an axis of symmetry, a vertex, and concavity. A parabola can be concave up, concave down, concave right, or concave left.

The general form of a parabola centered at the origin is an equation of the form  $Ax^2 + Dy = 0$  or  $By^2 + Cx = 0$ . The standard form of a parabola centered at the origin is an equation of the form  $x^2 = 4py$  or  $y^2 = 4px$ . The standard forms of parabolas with vertex  $(h, k)$  are  $(x - h)^2 = 4p(y - k)$  and  $(y - k)^2 = 4p(x - h)$ .

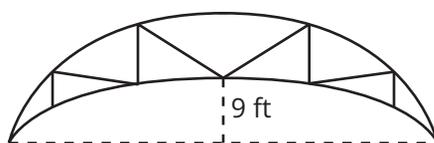
## Practice

- For each equation, determine the value of  $p$ , the coordinates of the vertex and focus, and the equations of the axis of symmetry and the directrix. Then graph the parabola and describe the concavity.
  - $x^2 = 3y$
  - $2y^2 = x$
  - $x = -(y - 2)^2 + 3$
  - $x^2 - 8x - 4y - 4 = 0$

2. Determine the equation of each parabola with the given focus and directrix. Let  $(x, y)$  represent a point on the parabola.
  - a. focus:  $(0, 3)$ ; directrix:  $y = -3$
  - b. focus:  $(-4, 0)$ ; directrix:  $x = 4$
  - c. focus:  $(7, 0)$ ; directrix:  $x = -7$
3. Write an equation in standard form for each parabola. Then graph and label the parabola.
  - a. A parabola with a vertex of  $(8, 6)$  and a focus of  $(6, 6)$ .
  - b. A parabola with a vertex of  $(1, 0)$  and a directrix of  $y = -3$ .

## Stretch

The finish line of a 5K race is an archway of balloons. The archway is formed by two parabolas, one representing the top of the archway and one representing the bottom of the archway as shown.



The width of the archway on the ground is 60 feet. The height of the top of the archway is 18 feet. The height of the bottom of the archway is 9 feet. The framework of the archway consists of vertical posts 10 feet apart with posts connecting the tops and bottoms of adjacent vertical posts. Calculate the sum of the lengths of the posts.

## Review

1. Given  $\cos \theta = -\frac{5}{13}$  in Quadrant III, use the Pythagorean identity to determine  $\sin \theta$ .
2. Given  $\cos \theta = \frac{2}{9}$  in Quadrant IV, determine  $\sin \theta$  and  $\tan \theta$ .
3. Solve each system of equations.
 

a. $\begin{cases} y = x^2 + 3x - 7 \\ x + y = -2 \end{cases}$	b. $\begin{cases} y = x^2 + 3x + 2 \\ y = 2x + 4 \end{cases}$
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4. Determine each product.
  - a.  $(x^3 - 6x + 5)(-2x^2 - 8x + 4)$
  - b.  $(2x^3 - 5x^2 - 7x + 12)(-11x^2 + 12x - 1)$