

TOPIC 9

Topic Review

? TOPIC ESSENTIAL QUESTION

- How do the geometric properties of conic sections relate to their algebraic representations?

Vocabulary Review

Choose the correct term to complete each sentence.

- The foci and the vertices of a hyperbola lie along the _____.
- The _____ of the ellipse is the midpoint of the major axis.
- A(n) _____ is the set of points P in a plane such that the sum of the distances from $P(x, y)$ to two fixed points F_1 and F_2 is a constant.
- A(n) _____ is a curve formed by the intersection of a plane and a double right cone.
- A(n) _____ is the set of all points in a plane equidistant from a given point called the focus and a given line called the directrix.

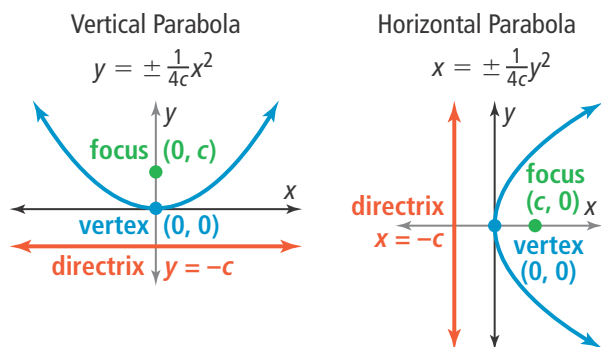
- center
- conic section
- ellipse
- hyperbola
- parabola
- transverse axis

Concepts & Skills Review

LESSON 9-1

Parabolas

Quick Review



Example

Find the equation of a parabola with vertex $(0, 0)$ and directrix $y = 3$.

Since the vertex is at the origin and the directrix is at $y = 3$, the focus is at $(0, -3)$. Therefore $c = -3$, and the parabola opens down.

The parabola has a vertical axis of symmetry, so use the equation $y = \frac{1}{4c}x^2$, where $c = -3$.

$$y = \frac{1}{4c}x^2 = \frac{1}{4(-3)}x^2 = -\frac{1}{12}x^2$$

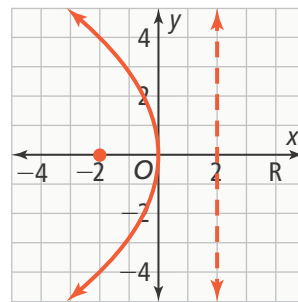
Practice & Problem Solving

Write an equation of the parabola given the focus and directrix.

- focus $(0, 1)$ and directrix $y = -1$
- focus $(-4, 0)$ and directrix $x = 4$
- What is the equation of the parabola?

10. Look for Relationships

How can you tell the direction a parabola opens when the focus and directrix are given?



- Make Sense and Persevere** A flashlight reflector has a cross section of a parabola. The bulb is at the focus and is 0.75 in. from the vertex of the reflector. Write an equation of a parabola that models this cross section.

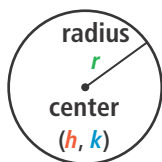
LESSON 9-2

Circles

Quick Review

A circle is a set of points equidistant from a center point. Standard form of an equation of a circle

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



Example

Find an equation of a circle with center $(-1, 2)$ and radius 3.

$h = -1, k = 2, r = 3$ Identify h, k , and r .

$(x - (-1))^2 + (y - 2)^2 = 3^2$ Substitute.

$(x + 1)^2 + (y - 2)^2 = 9$ Simplify.

Practice & Problem Solving

Find an equation of each circle described. Sketch the graph.

- center $(2, -4)$ and radius 3
- center $(-4, 1)$ and radius 2.5
- Reason** The equation of a circle is $(x - 3)^2 + (y + 7)^2 = 23$. What is the length of the diameter of the circle?
- Make Sense and Persevere** A cross section of a tennis ball is graphed on a coordinate plane where the endpoints of a diameter are $(1, 1.5)$ and $(3, 3.3)$. What equation describes the cross section of the tennis ball?

LESSONS 9-3 & 9-4

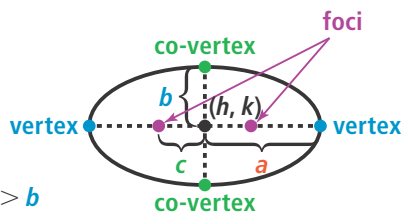
Ellipses and Hyperbolas

Quick Review

Ellipse

$$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$$

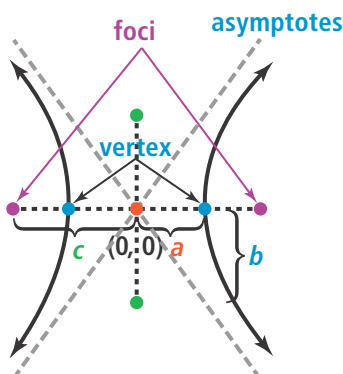
$$a^2 - b^2 = c^2, \text{ where } a > b$$



Hyperbola

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

$$a^2 + b^2 = c^2$$



Example

What is the equation of an ellipse with foci at $(-6, 0)$ and $(6, 0)$ that passes through the points $(0, -8)$ and $(0, 8)$?

The foci are each 6 units from the center so $c = 6$ and the center is the origin. The points $(0, -8)$ and $(0, 8)$ are the co-vertices and $b = 8$.

The equation is $\frac{x^2}{100} + \frac{y^2}{64} = 1$.

Practice & Problem Solving

- What is the equation of an ellipse with foci at $(-8, 0)$ and $(8, 0)$ and that passes through the points $(0, -3)$ and $(0, 3)$?
- What is the equation of a hyperbola with vertices $(0, -3)$ and $(0, 3)$ and asymptotes $y = \pm \frac{1}{8}x$?
- Communicate Precisely** Explain how the general form of a second-degree equation can be used to determine the type of conic section.
- Model With Mathematics** An ice skating rink is an elliptical shape that is 80 ft on its longest axis. The foci are 60 ft apart. The entrances are located at the co-vertices. Find the equation of the ellipse representing the shape of the rink. How far are the entrances, to the nearest tenth foot, from the center of the rink?