

Topic 9.3 Exponential Models

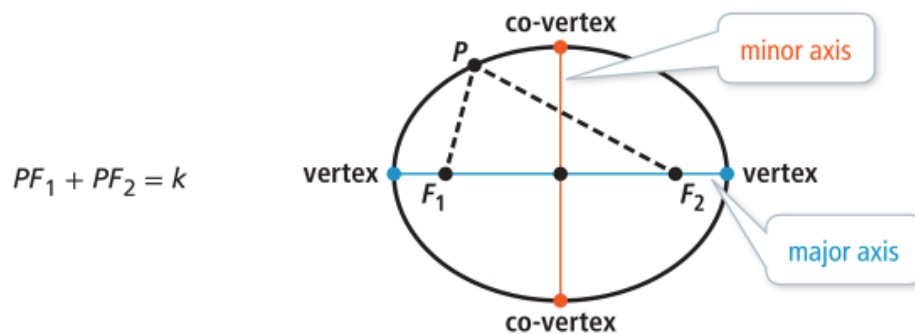
Essential Question:

How does the equation of an ellipse relate to the features of its graph?

CONCEPT: Features of an Ellipse

Features of an Ellipse

An **ellipse** is the set of points P in a plane such that the sum of the distances from P to two fixed points F_1 and F_2 is a constant. The fixed points are the **foci** (singular: "focus").



The **major axis** is the segment passing through the foci with endpoints on the ellipse. The endpoints of the major axis are called the **vertices** (singular: "vertex") of the ellipse.

The **minor axis** is the segment perpendicular to the major axis at the center with endpoints on the ellipse. The endpoints of the minor axis are called the **co-vertices** of the ellipse.

The **center of an ellipse** is the midpoint of the major or minor axis.

Q: How do the foci represent the ellipse?

Q: How do the vertices and co-vertices of an ellipse compare to each other?

Notes:

CONCEPT Summary

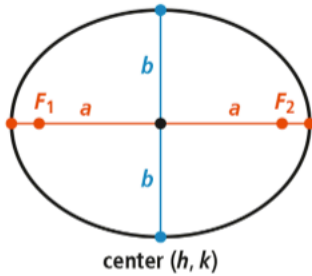
Ellipses

DEFINITION

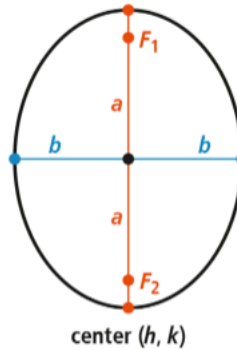
An ellipse is the set of points P in a plane such that the sum of the distances from $P(x, y)$ to two fixed points F_1 and F_2 is a constant.

GRAPHS

Horizontal Major Axis



Vertical Major Axis



EQUATIONS

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

If the major axis is horizontal,
 $(h \pm a, k)$ are the vertices,
 $(h, k \pm b)$ are the co-vertices,
and $(h \pm c, k)$ are the foci where
 $a^2 = c^2 + b^2$.

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

If the major axis is vertical,
 $(h, k \pm a)$ are the vertices,
 $(h \pm b, k)$ are the co-vertices,
and $(h, k \pm c)$ are the foci where
 $a^2 = c^2 + b^2$.

Q: How are the features of an ellipse affected by whether the major axis is horizontal or vertical?

Notes:

Examples & Questions

Examples 1

Q: Why do you use the Distance Formula to derive the equation of an ellipse?

Q: How do you know which equation of the ellipse to use when solving for the distance from the center to the vertices and co-vertices?

Q: What do a and b stand for in the standard form of the equation of an ellipse?

Q: How could you use transformations to relate the equation for an ellipse to the equation for a circle?

Examples 2

Q: How is the major axis determined using the equation of the ellipse in standard form?

Q: here are the foci found?

Q: Why should you use the Pythagorean Theorem to help find the foci?

Examples 3

Part A

Q: How can you find the vertices or co-vertices if you know the length of an axis?

Q: How do the vertices relate to the equation of an ellipse?

Part B

Q: When you know the foci and the co-vertices of an ellipse, what other information do you need to find in order to write the equation of the ellipse? Explain.

Examples 4

Q: Why is the negative value of b not considered as a solution of the equation of the ellipse?

Q: How can you determine how far the foci are from the center?

Examples 5

Q: Why do you add constants to each quadratic expression with x - and y -variables?

Q: Why is the center of the ellipse not at the origin?

Practice and Problem Solving

Complete MathXL for School: Practice and Problem Solving (online)

Complete MathXL for School: Enrichment (online)

Challenge: #10, 13– key will be posted in Power School Learning.

Lesson Quiz 9.3/Notes