Name ____________________ Date ________________________

Equations of Ellipses - Step-by-Step Lesson

Find the equations of an ellipse (in standard form) that has foci at (0,-5) and (0,5) and vertices at(0,-11) and (0,11).

Explanation:

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

To write the equation in standard form, the center, a^2 and b^2 must be found. The x coordinate of the vertices and foci given are 0, so the center of the e11ipse has to be (0,0).

|a| = horizontal distance

|b| = vertical distance

(H, k) = Center

(0,0) = Center

Vertices: (0,-11), (0,11)

Vertices are 22 units apart.

Foci: (0,5),(0,-5)

Foci are 10 units apart.

Since the foci are 10 units apart, indicating that |c| is 5 and c^2 , then is 25.

$|c| = 5 \quad c^2 = 5^2$

To find b^2, use the foci equation. c is the distance from the center of the ellipse to the foci. Since the center is (0, 0), and the vertices are (0,-11) and (0, 11), a equals 11.

$c^2 = |a - b|$

|C| = distance from center to foci

Name ____________________ Date ________________________

(0,0)=Center

(0,-11),(0,11)= vertices

|a| = distance from center to vertex

|a| = 11

Now that we have the values for a and c, we can substitute the values into the equation and simplify to find b.

$$C^2 = |a^2 - b^2|$$

$$(5)^2 = |11^2 - (b)^2|$$

$$25 = |121 - b^2|$$

$$b^2 = 121 - 25$$

$$b^2 = 96$$

Substitute 0 for h and k, the square root of 96 for b and 11 for a into the standard form equation of an ellipse. The equation is y squared over the square of 11 plus x squared over the square of the square root of 96 equals to1.

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

$$\frac{(y-0)^2}{(11)^2} + \frac{(x-0)^2}{(\sqrt{96})^2} = 1$$

$$\frac{y^2}{(11)^2} + \frac{x^2}{(\sqrt{96})^2} = 1$$