Example 1 Ellipses p. 7 Ch 11

This is an shifted ellipse

We began this problem in Example a)

$$9x^2 - 36x + 4y^2 = 0$$

- Starting from where we left off in Example #a on page 7

$$\frac{(x-2)^2}{4} + \frac{y^2}{9} = 1$$

$$\frac{(x-2)^2}{4} + \frac{y^2}{9} = 1$$

- Get a, b & c
- a^2 is the larger denominator

  so, $a^2 = 9$ so, $a = 3$
- b^2 is the smaller denominator

  so, $b^2 = 4$ so, $b = 2$
- $c^2 = a^2 - b^2$

  so, $c = \sqrt{c^2} = \pm\sqrt{9-4} = \pm\sqrt{5}$

  so, $c = \approx\pm 2.2$

a) Give the center

- The center is at (h, k)

$$\frac{(x-2)^2}{4} + \frac{y^2}{9} = 1$$

So, C(2, 0)

b) Find the Foci

- Use c to give the foci. For an ellipse which a vertical major axis (y^2 denominator > x^2 denominator) the foci will be $(h, k + c)$ & $(h, k – c)$

$$F_1(2, 0 + 3) \quad \& \quad F_2(2, 0 – 3)$$

So, $F_1(2, 3)$ & $F_2(2, -3)$

c) Give the Vertices

- The vertices are (h,k + a) & (h, k – a) since this ellipse has a major axis that is vertical

$$V_1(2, 0 + 3) \ \& \ V_2(2, 0 - 3)$$

So, $V_1(2, 3)$ & $V_2(2, -3)$

d) Find the Eccentricity

- The eccentricity tells us how “squashed” the ellipse is around its major axis. $e = {}^{c}/_{a}$

So, $e = {}^{\sqrt{5}}/_{3}$

Note: This is looking less like a circle because it is closer to 1 than it is to zero.

e) Find the Major Axis length

- The major axis is vertical since the larger denominator is on the y^2. That is a^2 & $a = 3$

Major Axis Length: 2(3) = 6

So, we see that the vertices being at (2, 3) & (2, -3) puts them 6 units apart which is the length of the major axis.

f) Find the Minor Axis length

- The minor axis is horizontal since the smaller denominator is on the x^2. That is b^2 & $b = 2$

Minor Axis Length: 2(2) = 4

So, we see that two points on a horizontal line through the center, and 2 units to the left & right of center are at (2-2, 0) & (2+2, 0) or (0, 0) & (4, 0) putting them 4 units apart which is the length of the minor axis.

g) Sketch the graph

- 1st Place the vertices
- 2nd Place the foci
- 3rd Place the 2 points

on the minor axis

- 4th Draw the ellipse