Ellipse: Sec. 9.1

General Form:

$$Ax^2 + Bx + Cy^2 + Dy + E = 0$$

Standard form:

$$\frac{(x-h)^2}{\underset{\uparrow}{a^2}} + \frac{(y-k)^2}{b^2} = 1 \quad \leftarrow \text{This must be equal to 1.}$$

Major axis is horizontal.

$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{\underset{\uparrow}{a^2}} = 1 \quad \leftarrow \text{This must be equal to 1.}$$

Major axis is vertical.

$center : (h, k)$

Major and minor axes of lengts 2a and 2b, where $0 < b < a$.

The foci lie on the major axis, c units from the center,

with $c^2 = a^2 - b^2$

To measure the ovalness of an ellipse, you can use the concept of eccentricity.

The eccentricity “*e*” of an ellipse is given by the ratio $e = \frac{c}{a}$

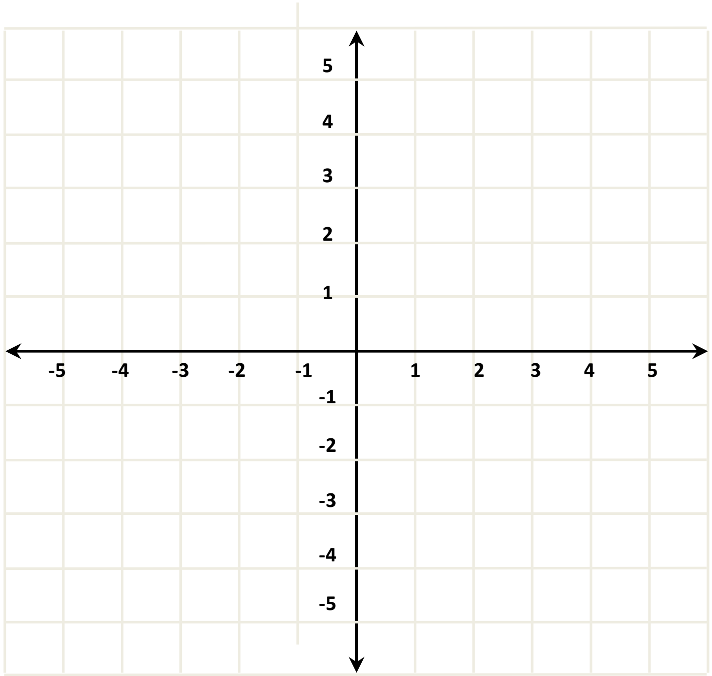
$0 < e < 1$ for every ellipse.

For a more circular ellipse,
the ratio is small (closer to 0).
The foci are close to the center.

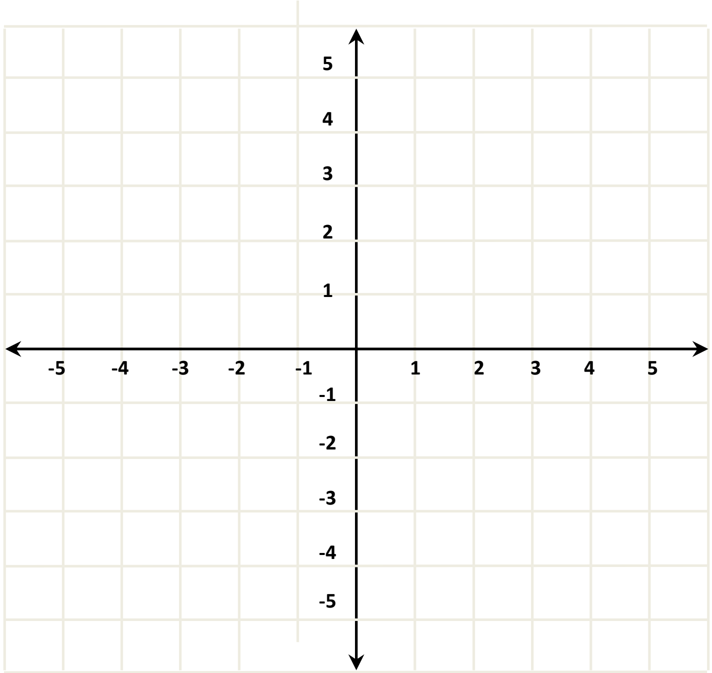
For a more elongated ellipse,
the ratio is close to 1.
The foci are close to the vertices.

Ex. 1) Find the standard form of the equation, the center, vertices, foci, and eccentricity of the ellipse. Then sketch the ellipse, labeling these parts.

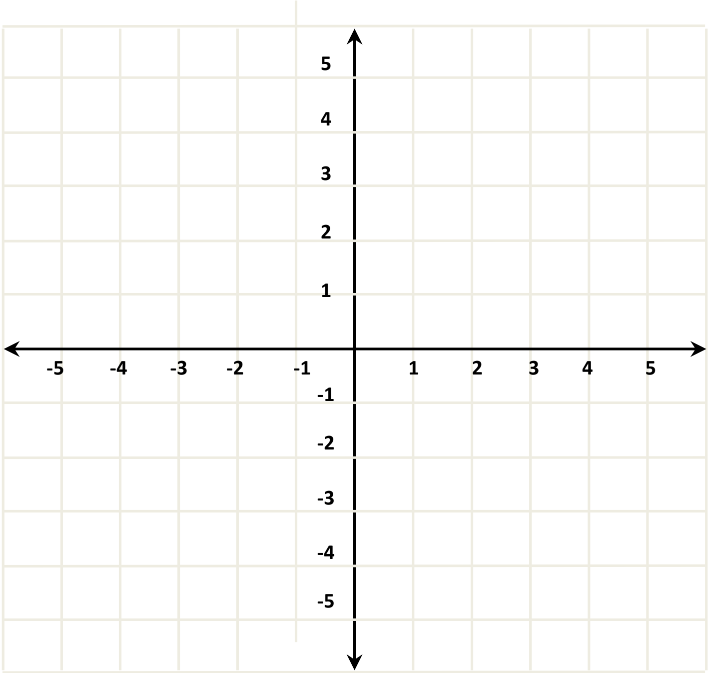
A) $4x^2 + y^2 = 36$



B) $9x^2 + 4y^2 - 54x + 40y + 37 = 0$

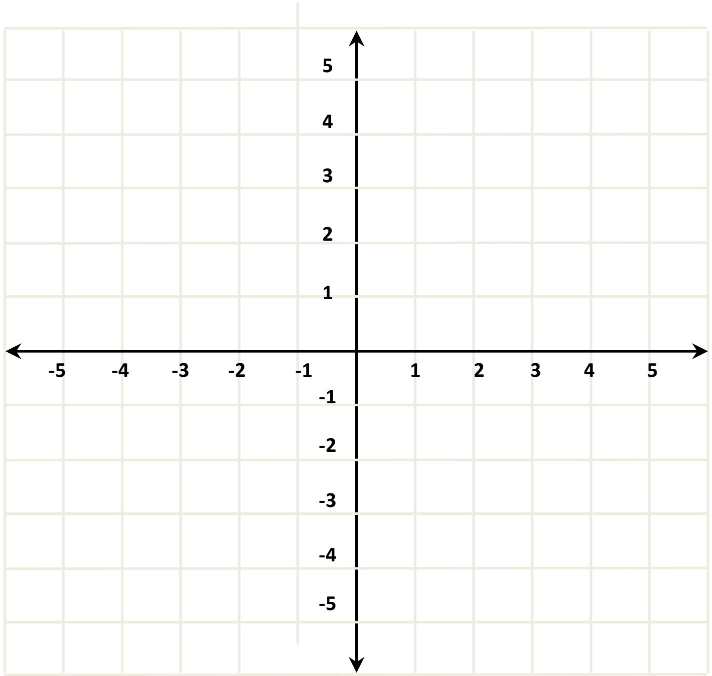


c) $x^2 + 4y^2 - 6x + 20y - 2 = 0$



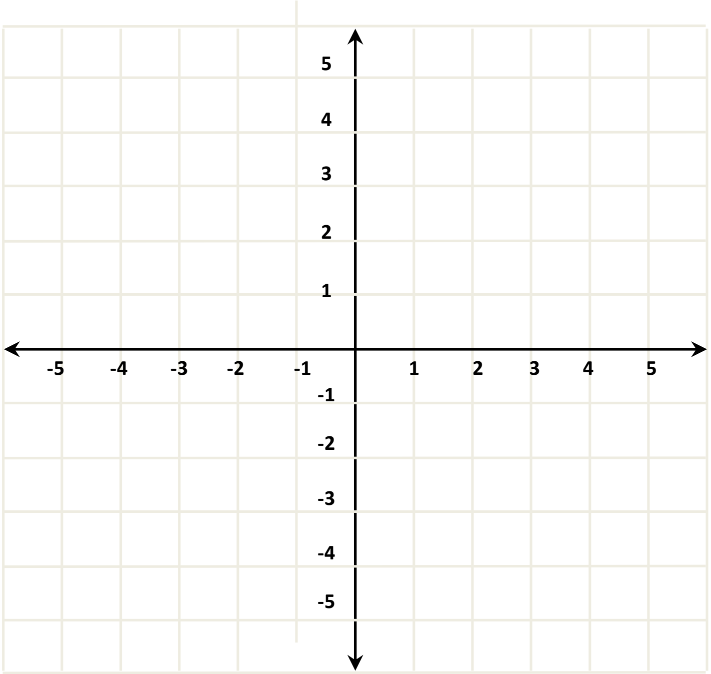
Ex. 2) Find the equation, in standard form, of the specified ellipse. **"PLOT WHAT YOU'VE GOT!"**

A) vertices: (0, ± 8); foci: (0, ± 4)



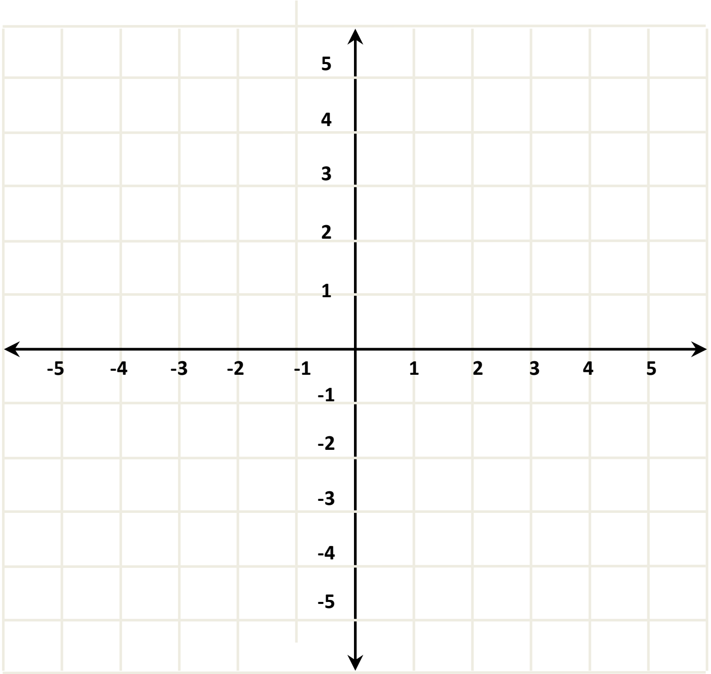
“PLOT WHAT YOU’VE GOT!”

B) foci: (± 2, 0);   major axis is 12.



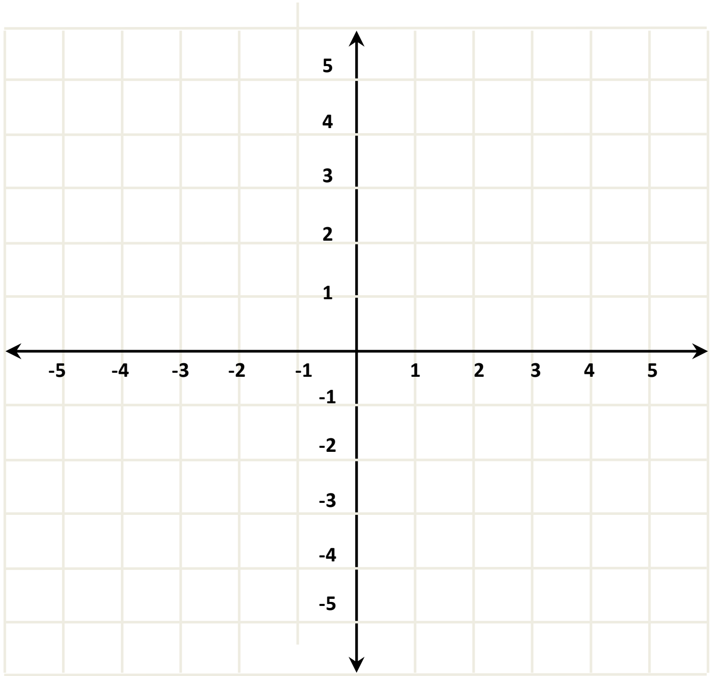
“PLOT WHAT YOU’VE GOT!”

C) foci: (-3, 4) and (-3, 0); major axis is 8



Extra Practice: Write the standard form of the conic:

1) Given a circle with center (2, -1) and a point on the circle at (5, 3).



Extra Practice: Write the standard form of the conic:

2) Given a parabola with focus (4, -7) and directrix y=1.