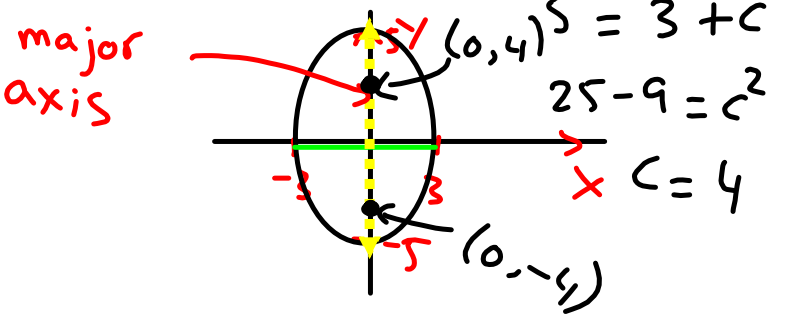
Ellipse

An ellipse is a curve such that the sum of distances between any point on the curve and two fixed points, called the foci (plural of focus) is constant . The equation of an ellipse is

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

- The coordinates of the center are (0,0)
- The length of the horizontal axis corresponds to 2|a|
- The length of the vertical axis corresponds to 2|b|
- The foci are always located on the longer of the two axis also called the major axis.
- if (a>b), then $a^2 = b^2 + c^2$
- if (b>a), then $b^2 = a^2 + c^2$ (c is the distance between the origin and the focii)
- The coordinates of the vertices are (a, 0), (-a,0), (0, b), (0, -b)

$$\frac{x^2}{3^2} + \frac{y^2}{5^2} = 1$$



$5^2 = 3^2 + c^2$

$25 - 9 = c^2$

$c = 4$

Ex2:-

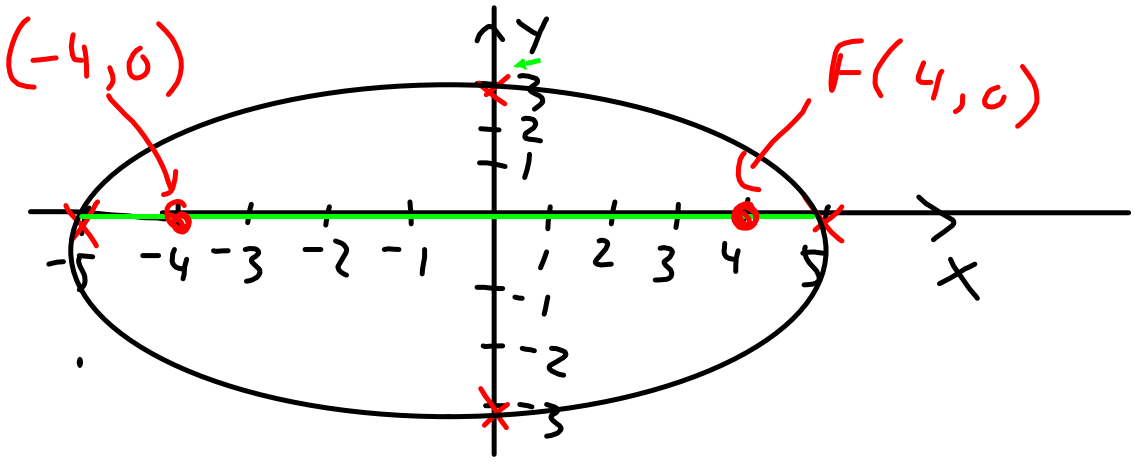
$$\frac{x^2}{25} + \frac{y^2}{9} = 1$$

To Graph

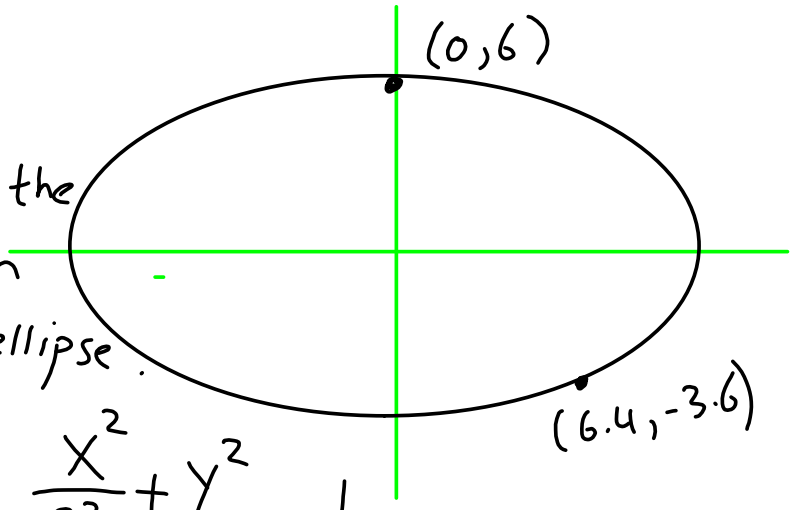
$$a^2 = b^2 + c^2$$

$$\frac{x^2}{5^2} + \frac{y^2}{3^2} = 1$$

(write denominators as perfect squares)



Ex 3



Find the equation of the ellipse.

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

$$\frac{x^2}{a^2}+\frac{y^2}{6^2}=1$$

Plug in $(6.4,-3.6)$.

$$\frac{6.4^2}{a^2}+\frac{(-3.6)^2}{6^2}=1$$

$$\frac{40.96}{a^2}+\frac{12.96}{36}=1$$

$$\frac{40.96}{a^2}=1-0.36$$

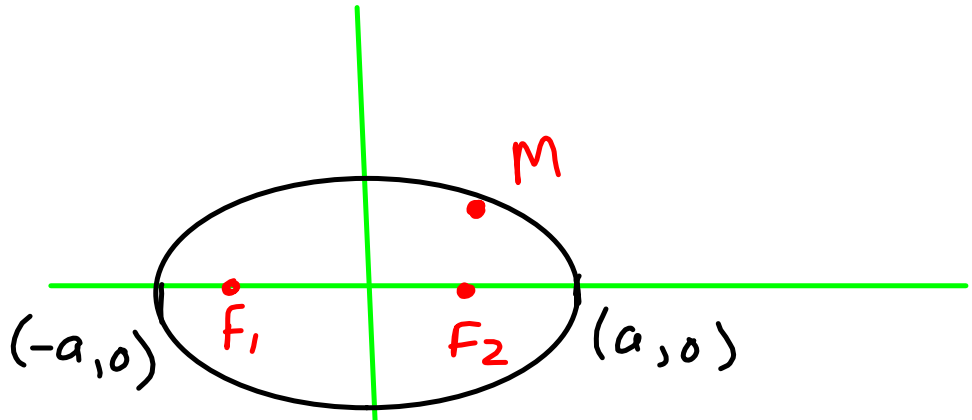
$$\frac{40.96}{a^2}=0.64$$

$$\frac{40.96}{0.64}=a^2$$

$$64=a^2$$

$$a=\sqrt{64}=\pm 8$$

$$\frac{x^2}{8^2}+\frac{y^2}{6^2}=1$$



$$d(M,F_1)+d(M,F_2)=2a$$

Major Axis

From standard to general and back!

$$36\left(\frac{x^2}{9}+\frac{y^2}{4}\right)=(1)36$$

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

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

General

① Multiply with LCM

② Simplify.

③ Move every term to LHS

From General to Standard:

Trick to create a 1 on the R.H.S of the equation!

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

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

Divide by 36

$$\frac{4x^2}{36}+\frac{9y^2}{36}=\frac{36}{36}$$

Simplify

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

P 332 – 335
All Questions.

$$144\left(\frac{x^2}{9}+\frac{y^2}{16}\right)=(1)\,144$$

$$16x^2+9y^2=144$$

$$16x^2+9y^2-144=0$$