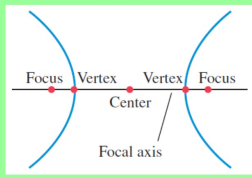


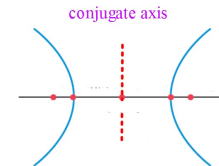
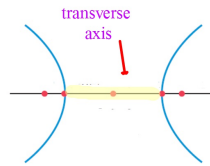
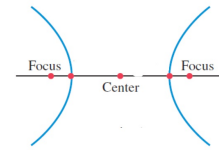
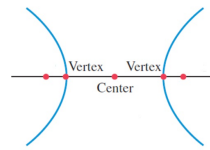
## 8.3 Hyperbolas



### OBJECTIVES:

You will be able to find the equation for a hyperbola, as well as its vertices and foci.

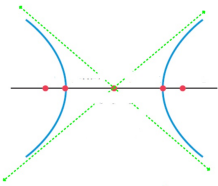
### Terminology:



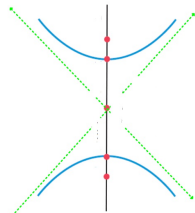
### Standard form of equations of hyperbolas with center (h, k):

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

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



asymptotes  $m = \pm \frac{b}{a}$

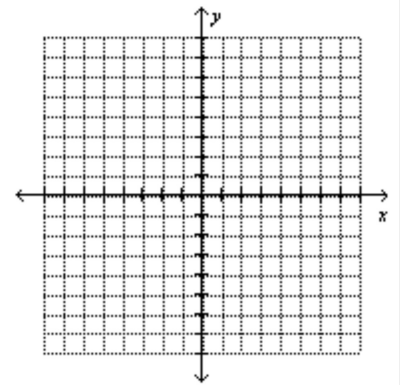


asymptotes  $m = \pm \frac{a}{b}$

Pythagorean relationship:  $c^2 = a^2 + b^2$

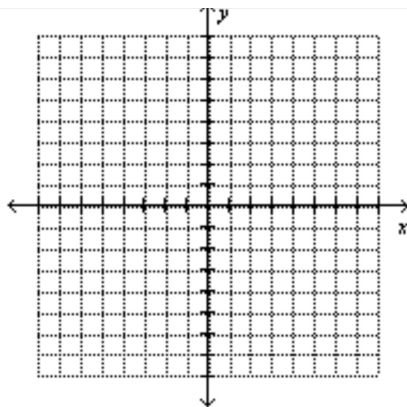
### Graphing a hyperbola:

$$\frac{(x-1)^2}{16} - \frac{(y+2)^2}{25} = 1$$



Try graphing this one.

$$\frac{(y-3)^2}{9} - \frac{(x-4)^2}{4} = 1$$

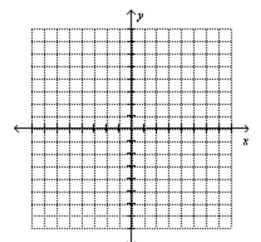


The eccentricity of a hyperbola is defined the same way as an ellipse.

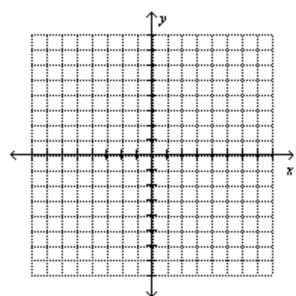
$$e = \frac{c}{a}$$

examples...

- Write an equation for the hyperbola with foci  $(0, \pm 3)$  and transverse axis length 4. Then find the eccentricity of the hyperbola.



2. Write an equation for the hyperbola transverse axis endpoints  $(-2, -2)$  and  $(-2, 6)$  and the slope of one asymptote is  $4/3$ .



3. Complete the square to graph the hyperbola. Then find its vertices, foci, and eccentricity.

$$25y^2 - 9x^2 - 50y - 54x - 281 = 0$$

