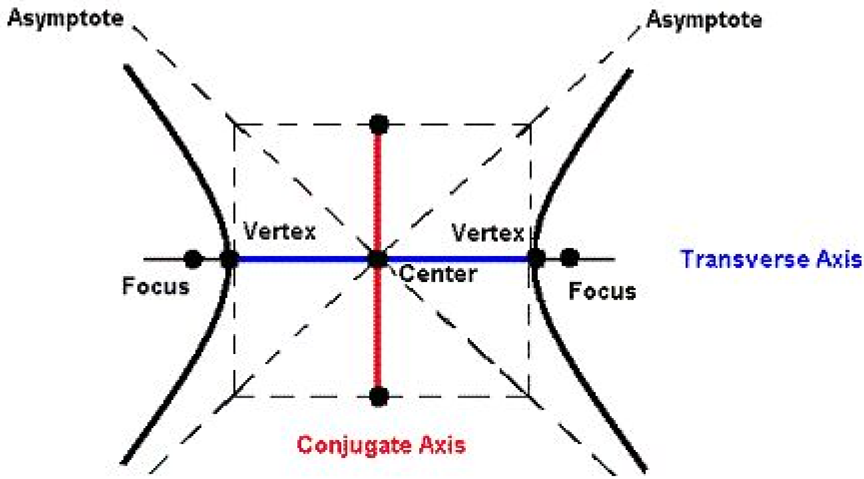
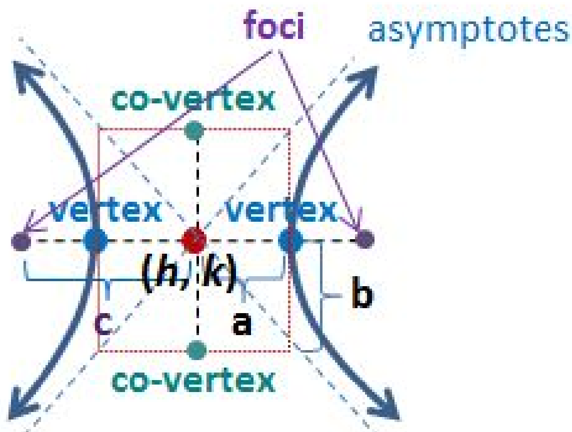
Pre Calculus 12
Conics - Hyperbola

Hyperbola



A hyperbola is the set of points in a plane whose distances to two fixed points (foci) in the plane have a constant difference

Horizontal Hyperbola **(x^2 comes first)**
At (0, 0): $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ **General:** $\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$ $a^2+b^2=c^2$ **Center:** (h,k) **Foci:** $(h\pm c,k)$ **Vertices:** $(h\pm a,k)$ **Co-Vertices:** $(h,k\pm b)$ **Asymptotes:** $y-k=\pm\frac{b}{a}(x-h)$ 

Vertical Hyperbola
(y^2 comes first)

At (0, 0): $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$

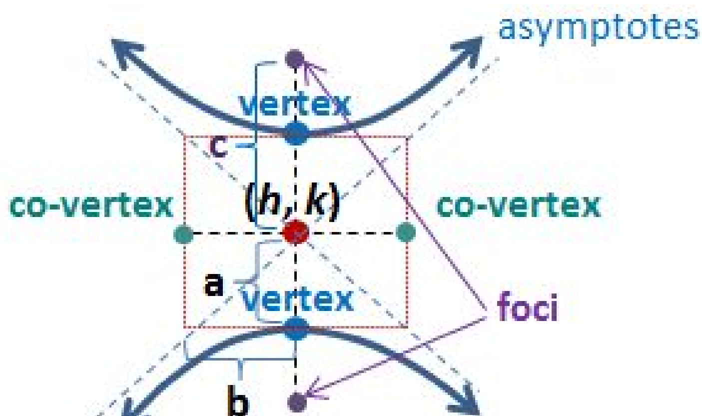
General: $\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$

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

Center: (h, k) **Foci:** $(h, k \pm c)$

Vertices: $(h, k \pm a)$ **Co-Vertices:** $(h \pm b, k)$

Asymptotes: $y - k = \pm \frac{a}{b}(x - h)$



Sample Question

Find the center, vertices, foci, asymptote equations and then draw the following:

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

Since this is y is first we know that this is a vertical major axis.

Now we use the formula sheet to find:
Center: $(h,k) = (0,0)$
Vertices: $(h, k \pm a) = (0, \pm 6)$
Before we find the foci, first we need to find c.

$$c^2 = a^2 + b^2$$
$$c^2 = 36 + 64 = 100$$
$$c = 10$$

Foci: $(h, k \pm c) = (0, \pm 10)$

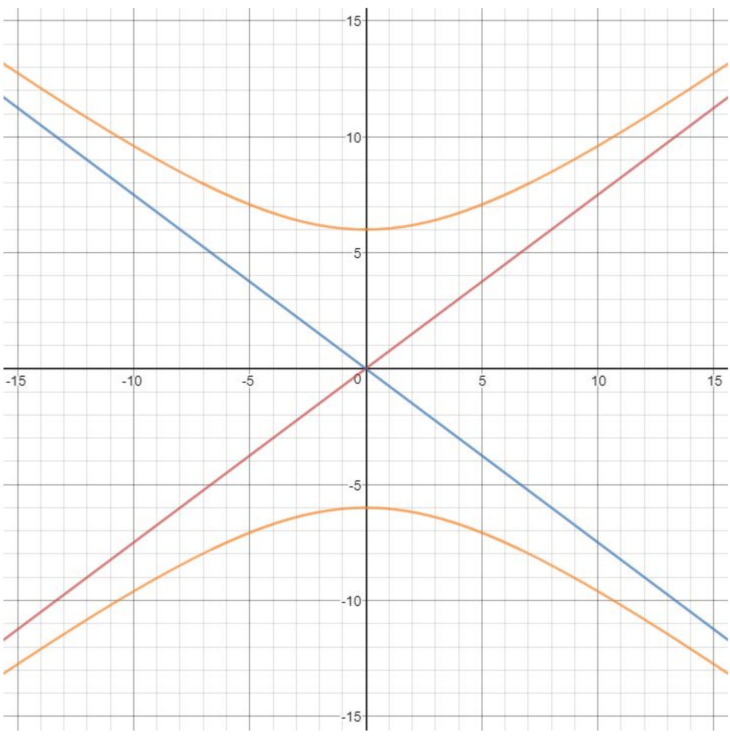
Continued

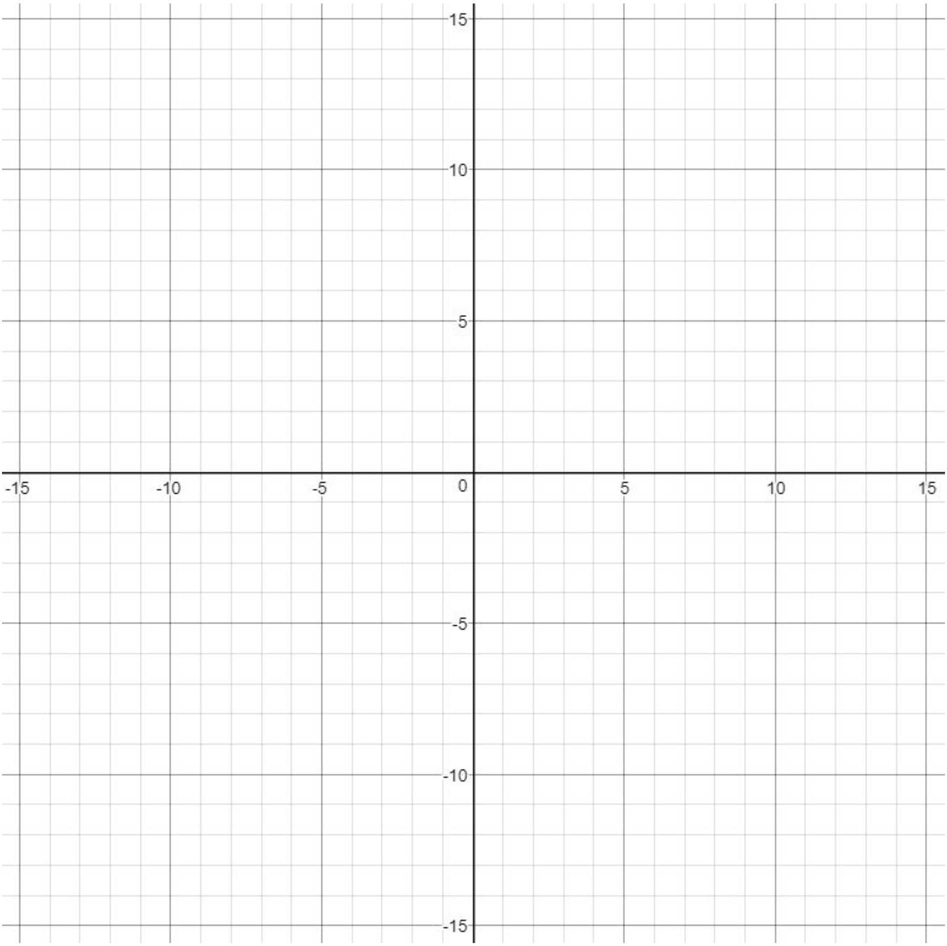
Next find the asymptote equation:

$$y = k \pm \frac{a}{b}(x - h)$$

$$y = \pm\frac{6}{8}(x)$$

and graph:

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