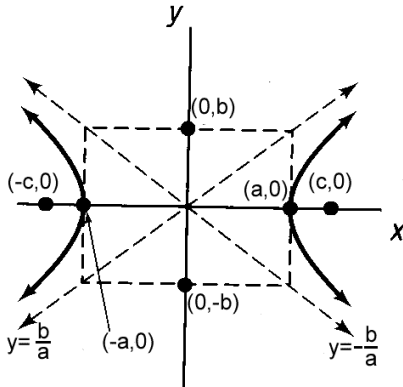
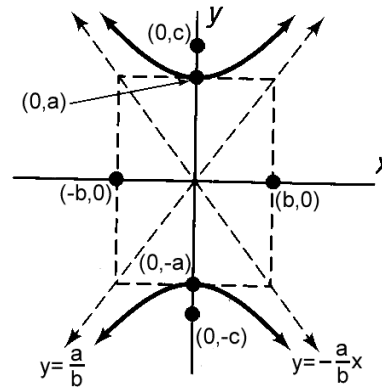


7.2 The Hyperbola

Hyperbolas centered at (0, 0).



(a) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ Asymptotes: $y = \pm \frac{b}{a}x$



(b) $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$ Asymptotes: $y = \pm \frac{a}{b}x$

In both of these cases the length of the **transverse** axis is $2a$. The length of the **conjugate** axis is $2b$. To find the c value in any of these graphs, use the equation $c = \sqrt{a^2 + b^2}$. This is used to find the foci. To find the **eccentricity** use the formula is $e = \frac{c}{a}$. The larger the e the wider the hyperbola is.

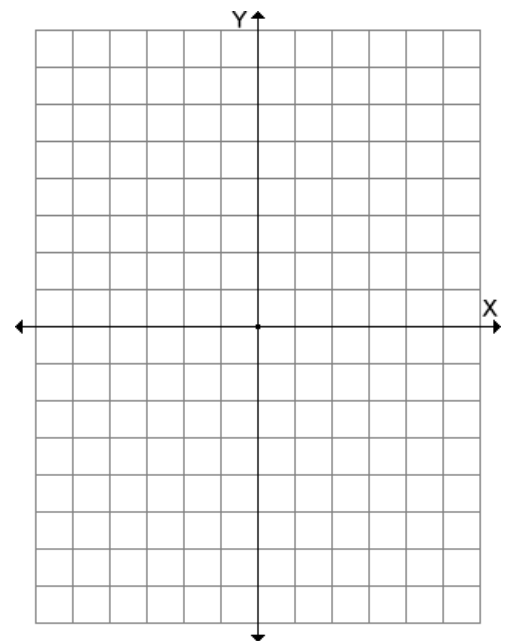
EXAMPLE: Graph $\frac{x^2}{9} - \frac{y^2}{4} = 1$ and identify the foci, eccentricity, center, length of the transverse and conjugate axis, vertices, and the equations of the asymptotes.

Center: _____ Vertices: _____

Foci: _____ Eccentricity: _____

Transverse: _____ Conjugate: _____

Asymptotes: _____



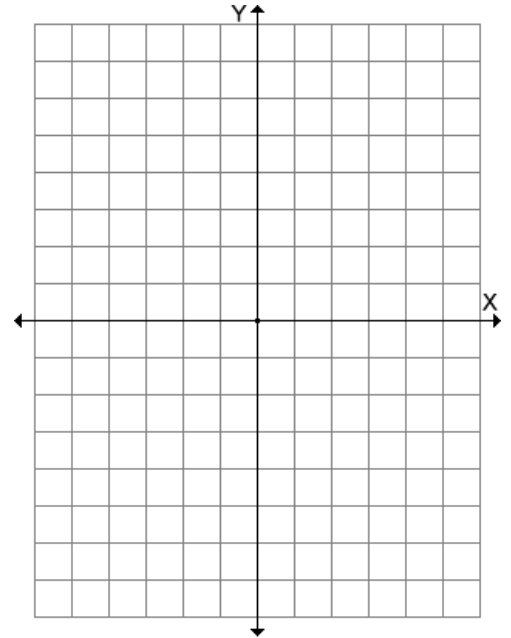
EXAMPLE: Graph $4y^2 - 16x^2 = 64$ and identify the foci, eccentricity, center, length of the transverse and conjugate axis, vertices, and the equations of the asymptotes.

Center: _____ Vertices: _____

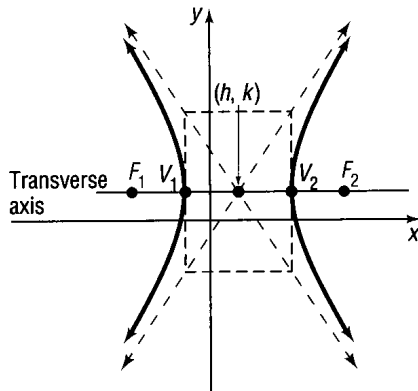
Foci: _____ Eccentricity: _____

Transverse: _____ Conjugate: _____

Asymptotes: _____



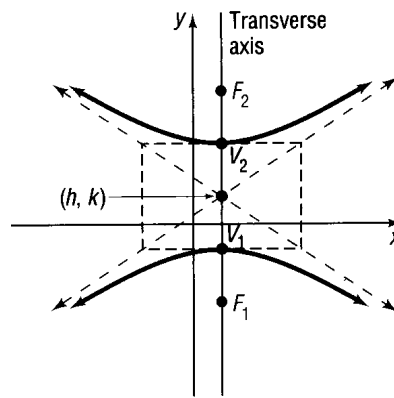
Hyperbolas centered at (h, k).



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

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

Vertices: $(h \pm a, k)$, Foci: $(h \pm c, k)$



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

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

Vertices: $(h, k \pm a)$, Foci: $(h, k \pm c)$

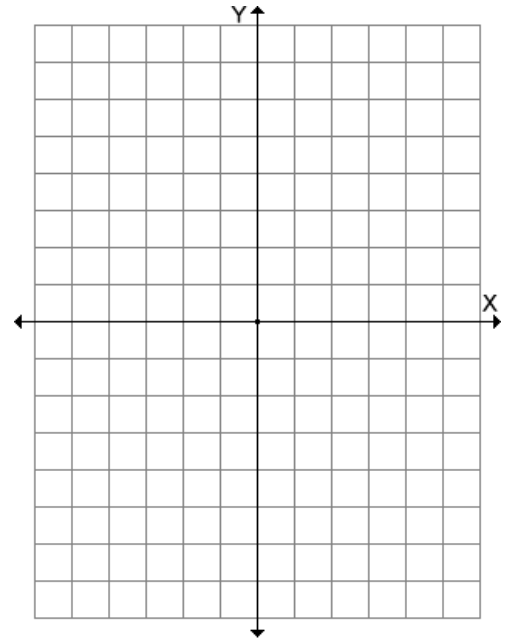
EXAMPLE: Graph $\frac{(x-3)^2}{1} - \frac{(y+1)^2}{4} = 1$ and identify the foci, eccentricity, center, length of the transverse and conjugate axis, vertices, and the equations of the asymptotes.

Center: _____ Vertices: _____

Foci: _____ Eccentricity: _____

Transverse: _____ Conjugate: _____

Asymptotes: _____



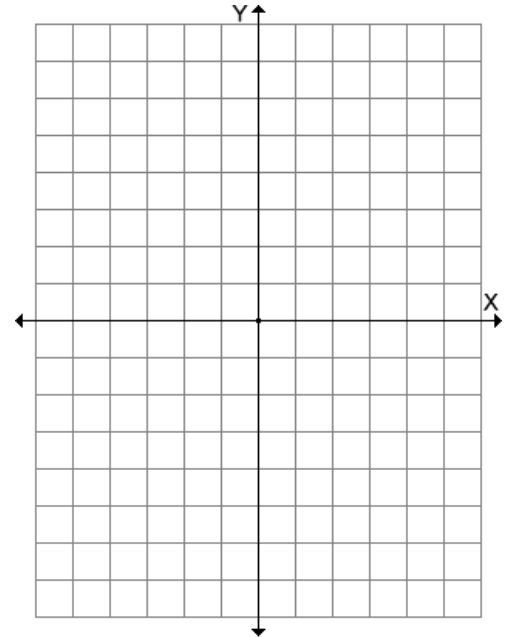
EXAMPLE: Graph $16x^2 - 9y^2 - 32x + 90y - 353 = 0$ and identify the foci, eccentricity, center, length of the transverse and conjugate axis, vertices, and the equations of the asymptotes.

Center: _____ Vertices: _____

Foci: _____ Eccentricity: _____

Transverse: _____ Conjugate: _____

Asymptotes: _____



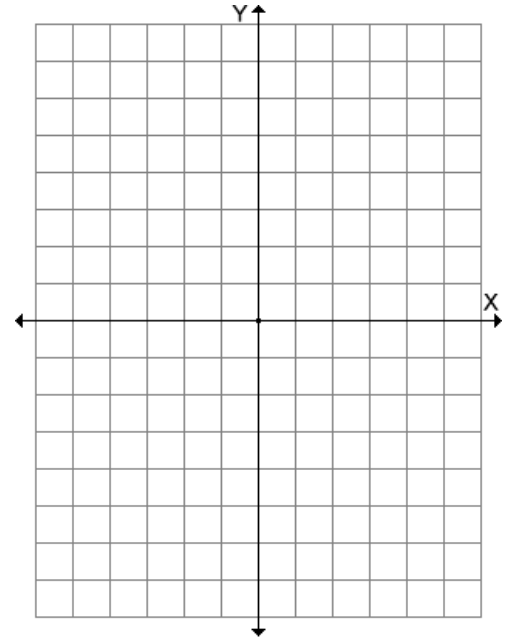
EXAMPLE: Graph $9y^2 - 18y - 4x^2 - 16x - 43 = 0$ and identify the foci, eccentricity, center, length of the transverse and conjugate axis, vertices, and the equations of the asymptotes.

Center: _____ Vertices: _____

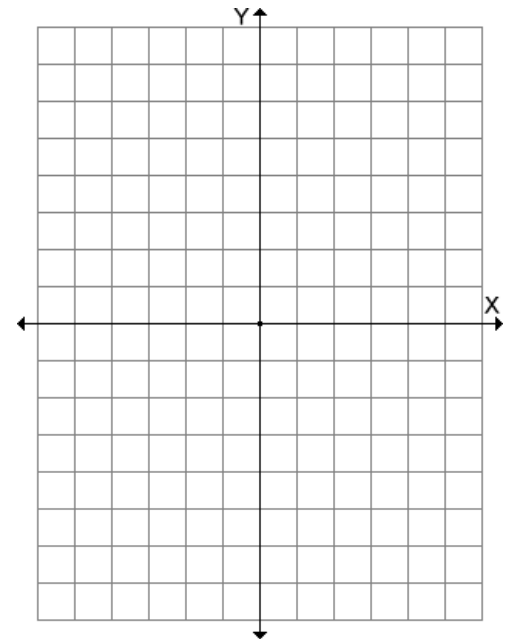
Foci: _____ Eccentricity: _____

Transverse: _____ Conjugate: _____

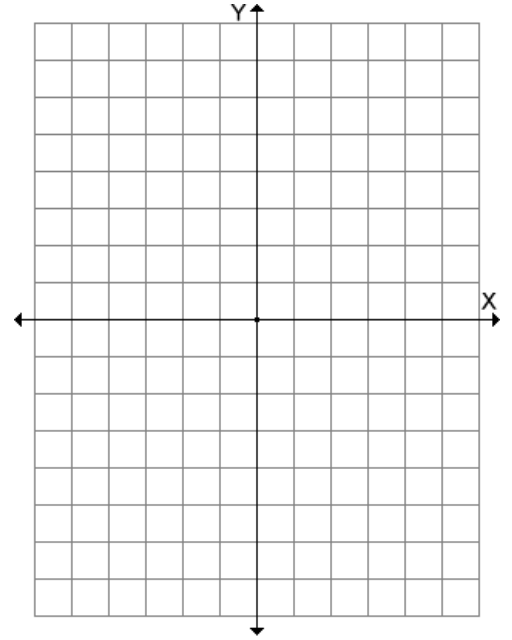
Asymptotes: _____



EXAMPLE: Find an equation for the hyperbola centered at the origin with focus at $(-3, 0)$ and vertex at $(2, 0)$.



EXAMPLE: Find an equation for the hyperbola with a focus at $(0, 6)$ and vertex at $(0, \pm 2)$.



EXAMPLE: Find an equation for the hyperbola with foci at $(0, \pm 2)$ and with an asymptote of $y = x$.

