Pre-Calculus

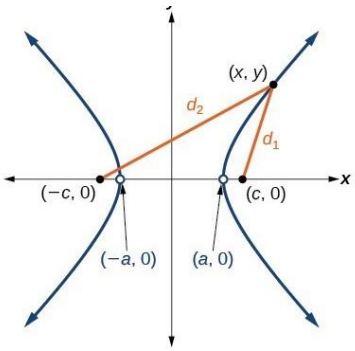
Notes 7.4

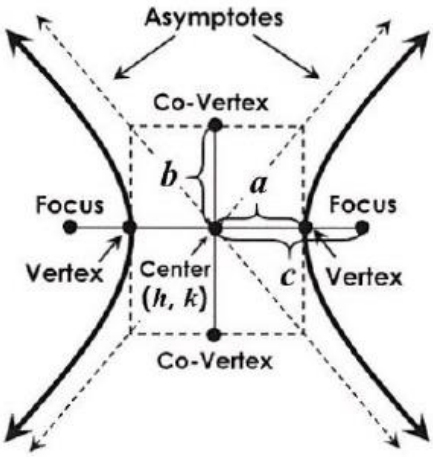
Hyperbolas

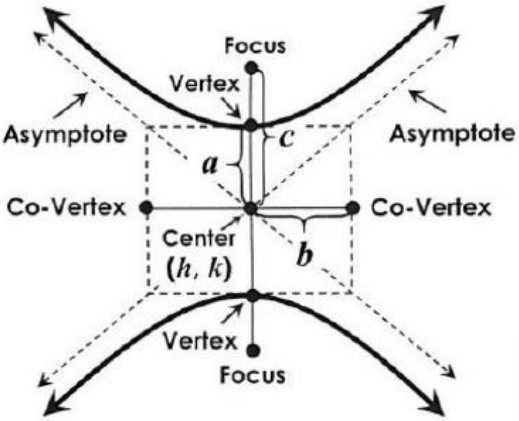
You should be able to:

- Put an equation in standard form of an hyperbola
- State the important info (center, vertices, foci, equations of the asymptotes)
- Sketch a graph

A **HYPERBOLA** is the set of all points in a plane whose distance from two fixed points, foci, in the plane have a constant difference.







	Horizontal	**Vertical**
Standard Form of Parabola	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$
Center	(h, k)	(h, k)
Focal Axis	$x = h$	$y = k$
Foci	$(h+c, k)$ & $(h-c, k)$	$(h, k+c)$ & $(h, k-c)$
Vertices	$(h+a, k)$ & $(h-a, k)$	$(h, k+a)$ & $(h, k-a)$
Length of Transverse Axis	$2a$	$2a$
Length of Conjugate Axis	$2b$	$2b$
Asymptotes	$y - k = \pm\frac{b}{a}(x-h)$	$y - k = \pm\frac{a}{b}(x-h)$
Pythagorean Relation	$c^2 = a^2 + b^2$	$c^2 = a^2 + b^2$

Ex 1) Given: $4x^2 - 9y^2 = 36$

a) Put the standard Form

h) Sketch the graph

b) State the center _____

c) State the vertices _____

d) State the foci _____

e) State the length of the transverse axis.

f) State the length of the conjugate axis.

g) Determine the equations of the asymptotes.

Ex 2) Given: $\frac{(x+5)^2}{9} - \frac{(y-2)^2}{49} = 1$

g) Sketch the graph

a) State the center _____

b) State the vertices _____

c) State the foci _____

d) State the length of the transverse axis.

e) State the length of the conjugate axis.

f) Determine the equations of the asymptotes.

Ex 3) Given: $25y^2 - 9x^2 - 50y - 54x - 281 = 0$

a) Put the standard Form

h) Sketch the graph

b) State the center _____

c) State the vertices _____

d) State the foci _____

e) State the length of the transverse axis.

f) State the length of the conjugate axis.

g) Determine the equations of the asymptotes.

Ex 4) Given: $4x^2 - 9y^2 - 16x - 72y - 129 = 0$

a) Put the standard Form

h) Sketch the graph

b) State the center _____

c) State the vertices _____

d) State the foci _____

e) State the length of the transverse axis.

f) State the length of the conjugate axis.

g) Determine the equations of the asymptotes.

Ex 5) The transverse axis of a hyperbola has endpoints $(-2,-1)$ and $(8,-1)$. The conjugate axis has a length of 8.

a) Find the equation of the hyperbola.

b) Determine the location of the foci.

c) Determine the equations of the asymptotes.

Ex 6) Write the standard conic form of the equation for the hyperbola with foci at $(3,\ 7)$ and $(7,7)$ and a vertex at $(6,7)$

Ex 7) Write the standard conic form of the equation for the hyperbola with an equation of an asymptote $y=\frac{2}{3}(x-1)-3$ and a vertex at $(1,-1)$.