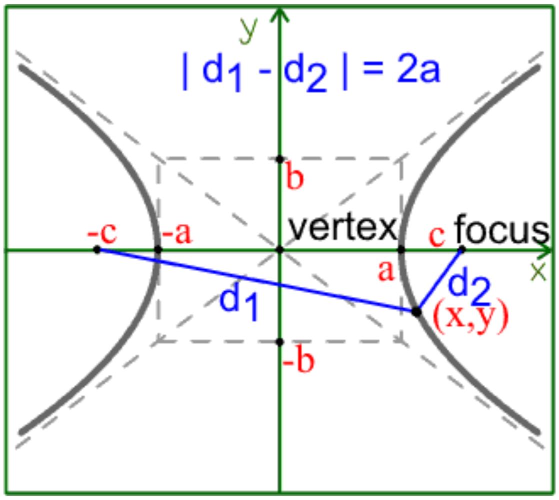
<u>Hyperbolas</u>

A **<u>hyperbola</u>** is a set of points in a plane such that the difference of the distances from points on the hyperbola to fixed points F_1 and F_2, the **<u>foci</u>**, is constant.



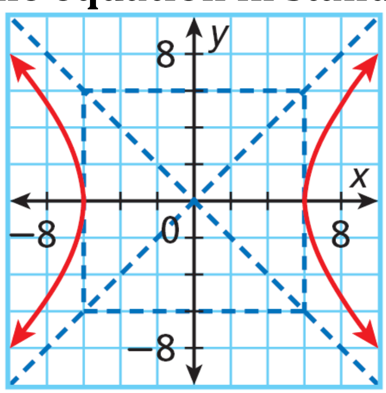
- A hyperbola contains two symmetrical parts called **<u>branches</u>**.
- A hyperbola also has two axes of symmetry.
  - The **<u>transverse axis</u>** contains the vertices and, if it were extended, the foci of the hyperbola.
  - The **<u>conjugate axis</u>** separates the two branches of the hyperbola.
    - The transverse axis is NOT ALWAYS longer than the conjugate axis.
- The **<u>vertices of a hyperbola</u>** are the endpoints of the transverse axis.
- The **<u>co-vertices of a hyperbola</u>** are the endpoints of the conjugate axis.

Assume $c = \sqrt{a^2 + b^2}$

Standard Form for the Equation of a Hyperbola **Center at (0, 0)**

TRANSVERSE AXIS	HORIZONTAL	VERTICAL
Equation	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$
Vertices	$(a, 0), (-a, 0)$	$(0, a), (0, -a)$
Foci	$(c, 0), (-c, 0)$	$(0, c), (0, -c)$
Co-vertices	$(0, b), (0, -b)$	$(b, 0), (-b, 0)$
Asymptotes	$y = \pm\frac{b}{a}x$	$y = \pm\frac{a}{b}x$

Example #2: **Write the equation in standard form.**



Example #3:

Write the equation in standard form of the hyperbola with center at the origin, vertex (4, 0), and focus (10, 0).

You try: **Vertex (0, 9), co-vertex (7, 0), Center at origin.**

Example #4: **Find the vertices, co-vertices, foci, and asymptotes of the hyperbola, and then graph.**

$$\frac{x^2}{16} - \frac{y^2}{36} = 1$$

You try: **Find the vertices, co-vertices, foci, and asymptotes of the hyperbola, and then graph.**

$$\frac{x^2}{49} - \frac{y^2}{4} = 1$$