HYPERBOLAS

A hyperbola provides an amazing context as we learn the different examples of equations and graphs. Its equation may have similarities to the equation of the ellipse except for the sign.

Standard Equation: (Transverse Axis is horizontal)

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

Where (h, k) is the **center** of the hyperbola, and **a > b**

$(h \pm a, k)$ are the coordinates of the **vertices**

$(h, k \pm b)$ are the coordinates of the **co-vertices**

2a is the length of the **transverse axis**

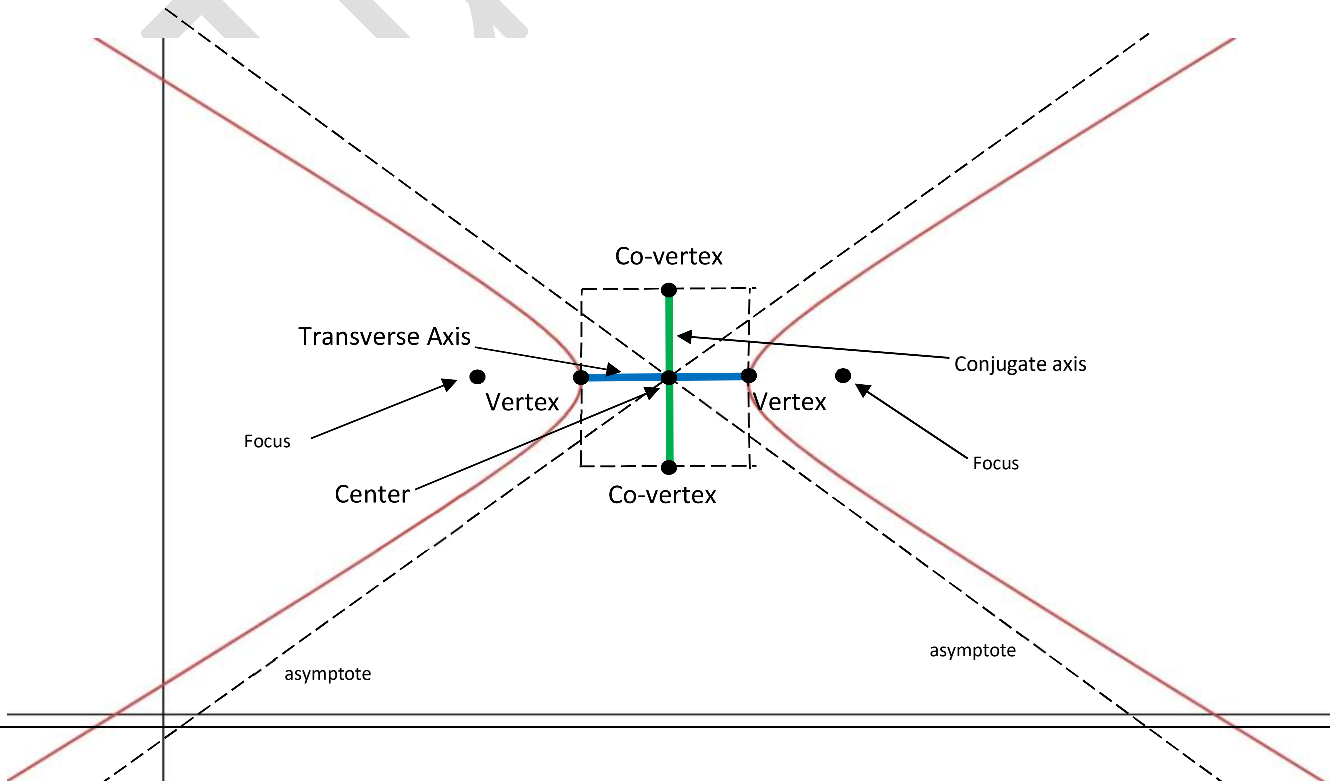
2b is the length of the **conjugate axis**

$(h \pm c, k)$ are the coordinates of the **foci** (plural of focus)

$y - k = \pm\frac{b}{a}(x-h)$ are the equations of the asymptotes

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

GRAPH



- The coordinates of the foci are (h, k+c), which is **(2, -3+$\sqrt{33}$)** and (h, k – c) which is **(2, -3–$\sqrt{33}$)**

C.

5. Step 1. $\frac{(x-4)^2}{25} - \frac{(y+6)^2}{9} = 1$ to $\frac{(x-h)^2}{a^2}$ - $\frac{(y-k)^2}{b^2} = 1$

   Step 2. $\frac{(x-4)^2}{5^2}$ - $\frac{(y+6)^2}{3^2} = 1$

   h = 4 k = -6 a = 5 b = 3

   $c^2 = a^2 + b^2$ = 25 + 9 = $c^2 = 34$

   c = $\sqrt{34}$

   Answer:

   The center is (h, k), and it is **(4, -6)**

   The vertices are ($h \pm a$, k), so these are (4 + 5, -6) → **(9, -6)** and (4-5, -6) → **(-1, -6)**

   The co-vertices are (h, $k \pm b$), so these are (4, -6+3) → **(4, -3)**, and (4, -6-3) → **(4, -9)**

   The length of transverse axis is 2a, so it is 2(5) = **10 units**

   The length of the conjugate axis is 2b, so it is 2(3) = **6 units**

   The foci are ($h \pm c$, k), so these are **(4+$\sqrt{34}$, -6)**, and **(4-$\sqrt{34}$, -6).**

   The asymptotes are y - k = $\pm\frac{b}{a}(x-h)$, so these are y + 6 = $\frac{3}{5}(x-4)$ → **y = $\frac{3}{5}(x-4)$ – 6**, and y + 6 = $-\frac{3}{5}(x-4)$ → **y = $-\frac{3}{5}(x-4)$ – 6**

6. Step 1. $\frac{(y-8)^2}{81} - \frac{(x+1)^2}{121} = 1$ to $\frac{(y-k)^2}{a^2}$ - $\frac{(x-h)^2}{b^2} = 1$