Hyperbola - Graphing Notes

Hyperbolas – Graphing

Hyperbola

A hyperbola is the set of all points (x, y) the difference of whose distances from two distinct fixed points (foci) is a positive constant.

The foci of a hyperbola lie on the transverse axis, c units from the center where $c^2 = a^2 + b^2$.

Horizontal Hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

F V   V F

transverse axis

(length between the vertices)

$$m = \pm \frac{b}{a}$$

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

Vertical Hyperbola

$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$

F
V

asymptotes
$$m = \pm \frac{a}{b}$$

V
F
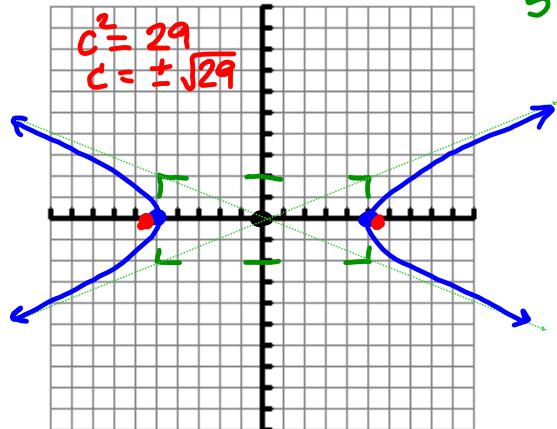
* the <u>first</u> denominator is important (not the largest)

Hyperbola - Graphing Notes

Example 1: $\dfrac{x^2}{25} - \dfrac{y^2}{4} = 1$ *horizontal* $m = \pm\dfrac{2}{5}$

$c^2 = 29$
$c = \pm\sqrt{29}$

Center $(0,0)$

Vertices $(-5,0)$ $(5,0)$
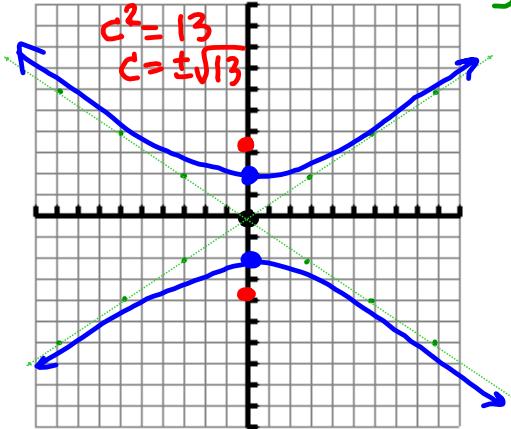
Foci $(\pm\sqrt{29}, 0)$

Asymptotes $= y = \pm\dfrac{2}{5}x$

Transverse axis length $= 10$

Example 2: $\dfrac{y^2}{4} - \dfrac{x^2}{9} = 1$ *vertical* $m = \pm\dfrac{2}{3}$

$c^2 = 13$
$c = \pm\sqrt{13}$

Center $(0,0)$

Vertices $(0,2)$ $(0,-2)$
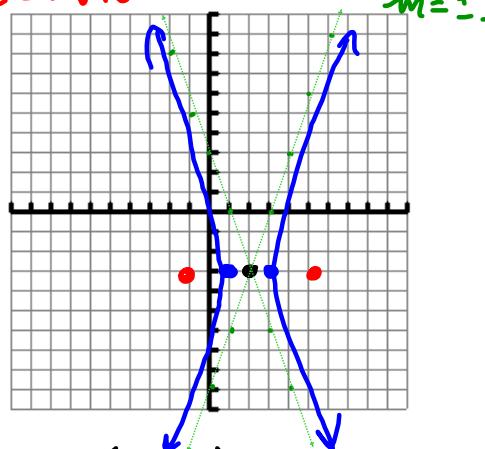
Foci $(0, \pm\sqrt{13})$

Asymptotes $= y = \pm\dfrac{2}{3}x$

Transverse axis length $= 4$

Example 3: $\dfrac{(x-2)^2}{1} - \dfrac{(y+3)^2}{9} = 1$

$c = \pm\sqrt{10}$ $m = \pm\dfrac{3}{1}$

Center $(2,-3)$

Vertices $(1,-3)$ $(3,-3)$
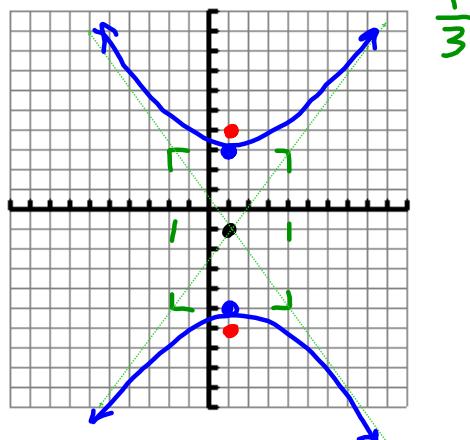
Foci $(2\pm\sqrt{10}, -3)$

Asymptotes $= y+3 = \pm3(x-2)$

Transverse axis length $= 2$

Example 4: $\dfrac{(y+1)^2}{16} - \dfrac{(x-1)^2}{9} = 1$

$c = \pm5$ $\dfrac{4}{3}$

Center $(1,-1)$

Vertices $(1,3)$ $(1,-5)$

Foci $(1,4)$ $(1,-6)$

Asymptotes $= y+1 = \pm\dfrac{4}{3}(x-1)$

Transverse axis length $= 8$