4/29 MON

9.2 The Hyperbola

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

opens along x-axis | opens along y-axis

(h,k) | (h,k)

$\pm a$ | $\pm a$

$\pm b$ | $\pm b$

$y - y_1 = m(x - x_1)$

Center

Vertices

Covertices

transverse axis (connects vertices) $2a$ | $2a$

* Conjugate axis (connects covertices) $2b$ | $2b$

Ellipse: major, minor

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

slope | slope

foci $\pm c$ | $\pm c$

(transverse axes)

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

* a^2 (pos variable)

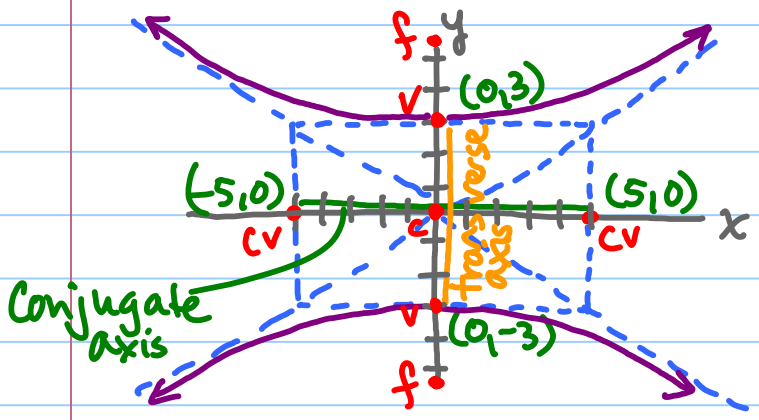
* b^2 (neg variable)

ex 1) $\frac{(y-k)^2}{9} - \frac{(x-h)^2}{25} = 1$

a^2 | b^2

$h \quad k$

$c: (0,0)$



* transverse axis : $2a$

* box connecting vertices & covertices

* foci? c?

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

$9 + 25 = c^2$

$34 = c^2$

$\pm 5.8 = c$

"rise" / run

$f: (0, \pm\sqrt{34})$

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

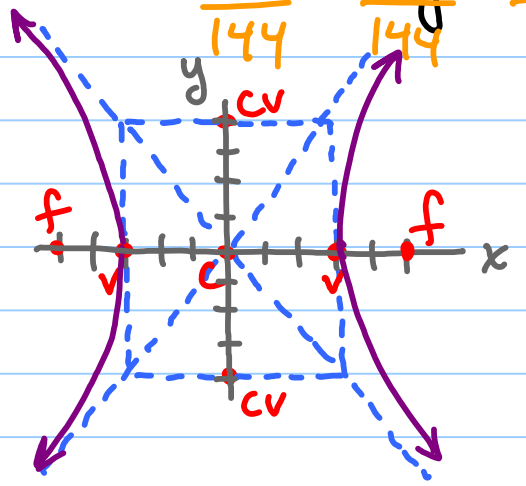
$y - 0 = \pm\frac{3}{5}(x-0)$

$y = \pm\frac{3}{5}x$

hyperbola

ex 2) $\frac{16x^2}{144} - \frac{9y^2}{144} = \frac{144}{144} \rightarrow \frac{x^2}{9} - \frac{y^2}{16} = 1$

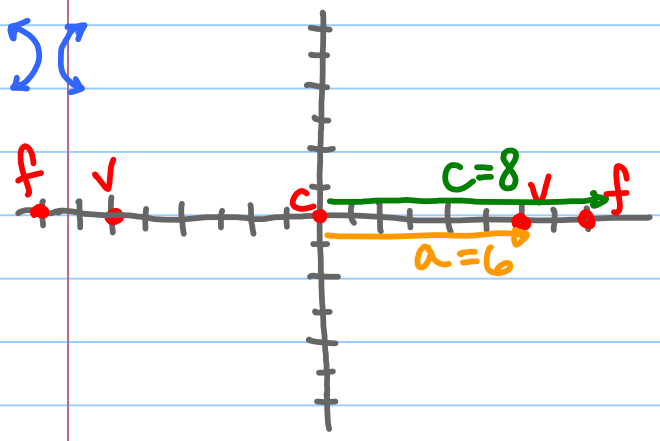
a^2 b^2 c:(0,0)



f: c?
$a^2+b^2=c^2$
$9+16=c^2$
$5=c$
f: (±5,0)

asymptotes:
$y-k=\pm\frac{b}{a}(x-h)$
$y=\pm\frac{4}{3}x$

ex 3) f: (-8,0), (8,0), v: (-6,0), (6,0)



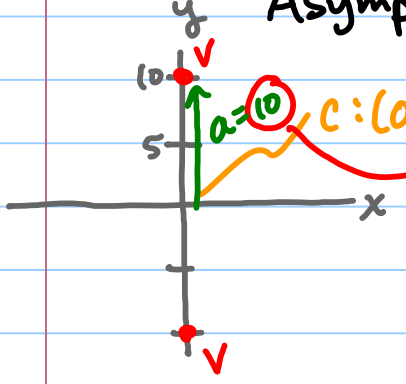
$\frac{(x-0)^2}{a^2} - \frac{(y-0)^2}{b^2} = 1$

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

b? $a^2+b^2=c^2$
$36+b^2=64$
$b^2=28$ ... $b=2\sqrt{7}$

$\frac{x^2}{36} - \frac{y^2}{28} = 1$

ex 4) Transverse axis (vertices: (0,-10),(0,10)).
Asymptote: $y=\frac{5}{8}x$



$\frac{5}{8} = \frac{a}{b}$

$\frac{5}{8} = \frac{10}{b}$

$b=16$

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

$\frac{y^2}{100} - \frac{x^2}{256} = 1$