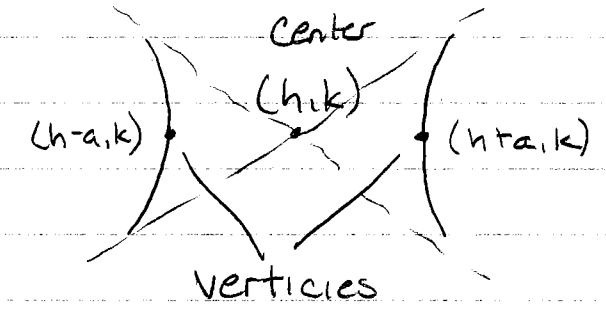
← Find asymptotes
63-70all

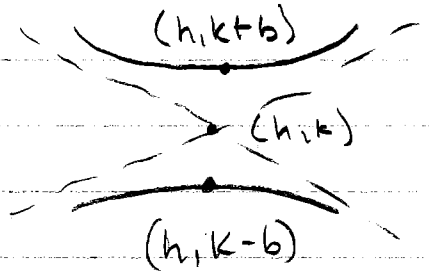
Conics - Hyperbolas

pg. 369 71-77 odd,

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



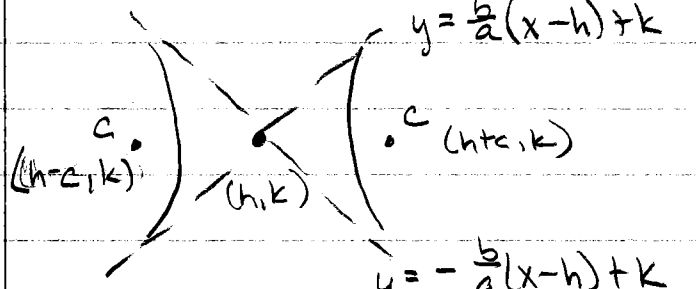
$$\frac{(y-k)^2}{b^2} - \frac{(x-h)^2}{a^2} = 1$$



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

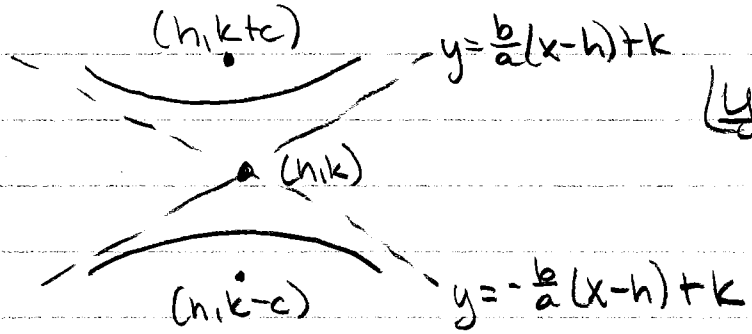
foci (c) $c^2 = a^2 + b^2$

* foci lie on the transverse axis



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

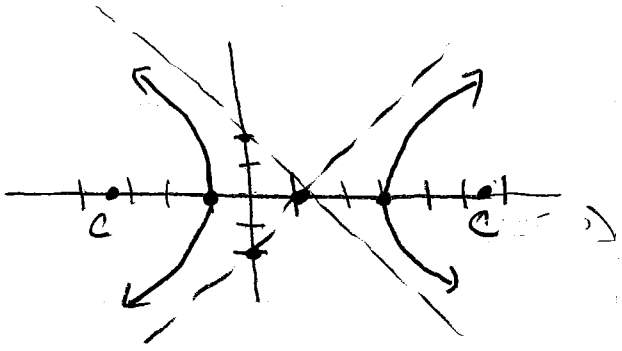
$$c^2 = a^2 + b^2$$



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

Example! Find the center, foci, asymptotes vertices

Ⓐ $\frac{(x-1)^2}{4} - \frac{y^2}{16} = 1$



Center (1, 0)

$b^2 = 16$ $a^2 = 4$

$b = 4$ $a = 2$

asymptotes: $y = \pm \frac{4}{2}(x-1) + 0$

$= \pm 2(x-1)$

$y = 2(x-1)$ $y = -2(x-1)$

$y = 2x - 2$ $y = -2x + 2$

vertices → opens left/right

left/right $\sqrt{4}$ of center $\left[\frac{(x-1)^2}{4}\right]$

(1+2, 0) (1−2, 0)

(3, 0) (−1, 0)

foci $c^2 = 4 + 16$

$= 20$

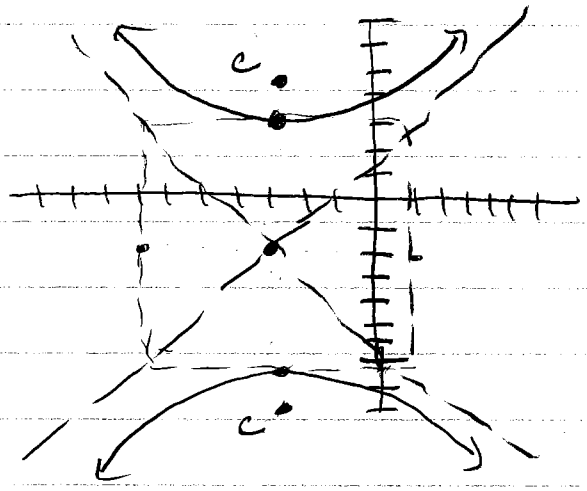
$= \sqrt{20}$

$= 2\sqrt{5}$ left/right $2\sqrt{5}$ of center

$(1+2\sqrt{5}, 0)$ $(1-2\sqrt{5}, 0)$

Hyperbolas - cont'd

(B) $\frac{(y+2)^2}{25} - \frac{(x+3)^2}{16} = 1$



$b^2 = 25$ $\quad a^2 = 16$

$b = 5$ $\quad a = 4$

(up/down) ... (right/left)

center $(-3, -2)$

vertices - opens up/down

up/down $\sqrt{25}$ from center

$(-3, -2+5)$ $\quad (-3, -2-5)$

$(-3, 3)$ $\quad (-3, -7)$

$\left[\frac{(y+2)^2}{25} \ldots\right]$

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

$y = \frac{5}{4}(x+3) - 2$

$= \frac{5}{4}x + \frac{15}{4} - 2$

$= \frac{5}{4}x + \frac{7}{4}$

$y = -\frac{5}{4}(x+3) - 2$

$= -\frac{5}{4}x - \frac{15}{4} - 2$

$= -\frac{5}{4}x - \frac{23}{4}$

* build a box up/down 5
right left 4

* diagonals are asymptotes

foci $\quad c^2 = 25 + 16$

$= 41$

$= \sqrt{41}$

$(-3, -2+\sqrt{41})$

$(-3, -2-\sqrt{41})$