12-2 Writing Equations of a Hyperbola

Parametric Equations of Hyperbola

Opens in x-direction (left and right)

$x = \sec T + h$
$y = \tan T + K$

**opens in direction where secT is

Opens in y-direction (up and down)

$x = \tan T + h$
$y = \sec T + K$

Write parametric equations. (same pictures from yesterday's notes to check)

1. $\left(\frac{x-1}{4}\right)^2 - \left(\frac{y+3}{2}\right)^2 = 1$

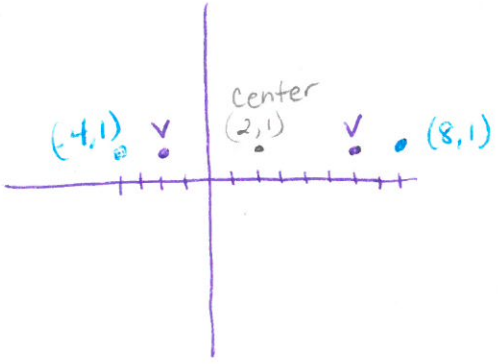
$x = 1 + 4\sec T$
$y = -3 + 2\tan T$

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

$x = -5 + 2\tan T$
$y = 4 + 3\sec T$

Write a Cartesian equation of the hyperbola that satisfies each set of conditions.

3. vertices (-2, 1) and (6, 1) and foci (-4, 1) and (8, 1)



center: (2, 1)
$a = 4$
$c = 6$

$c^2 = a^2 + b^2$
$36 = 16 + b^2$
$20 = b^2$
$\sqrt{20} = b$

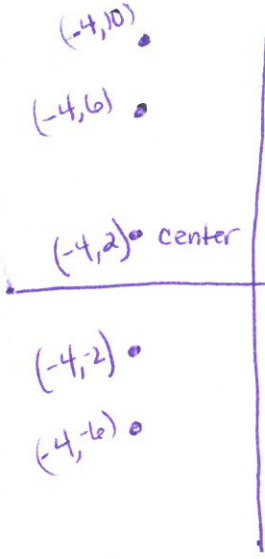
$e = \frac{c}{a}$
$e = \frac{6}{4}$ or $\frac{3}{2}$

Slopes of asymptotes: $\pm \frac{\sqrt{20}}{4}$
OR $\pm \frac{\sqrt{5}}{2}$

$\left(\frac{x-2}{4}\right)^2 - \left(\frac{y-1}{\sqrt{20}}\right)^2 = 1$

$x = 2 + 4\sec T$
$y = 1 + \sqrt{20}\tan T$

4. vertices (-4, 6) and (-4, -2) and foci (-4, 10) and (-4, -6)



$a = 4$

$c = 8$

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

$64 = 16 + b^2$

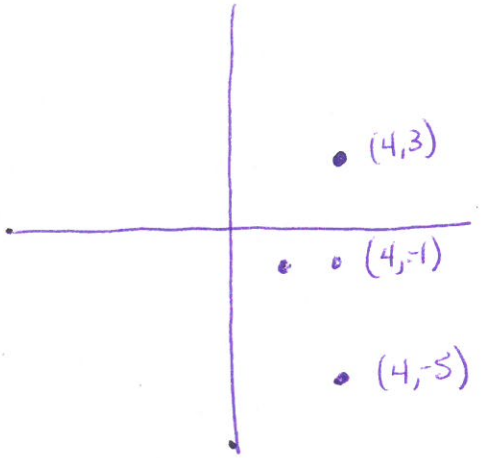
$\sqrt{48} = b$

$$-\left(\frac{x+4}{\sqrt{48}}\right)^2 + \left(\frac{y-2}{4}\right)^2 = 1$$

$x = -4 + \sqrt{48}\tan T$

$y = 2 + 4\sec T$

5. vertices (4, 3) and (4, -5), conjugate axis length of 4



$a = 4$

$b = 2$ (axis is entire length, need radius)

$$-\left(\frac{x-4}{2}\right)^2 + \left(\frac{y+1}{4}\right)^2 = 1$$

$x = 4 + 2\tan T$

$y = -1 + 4\sec T$