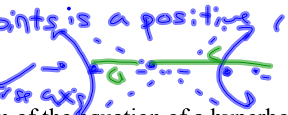
9-3 HYPERBOLAS

Hyperbola - the set of all points in a plane, the difference whose distance from 2 distinct points is a positive constant




transverse axis

Standard form of the equation of a hyperbola -

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

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

Center $(h, k)$

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

Vertices: a from the center

Foci: c from the center

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

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

Ex 1 Find the center, vertices, foci, asymptotes, and graph:

$$\frac{(x-2)^2}{4} - \frac{(y-2)^2}{5} = 1$$

$\sqrt{4}$ $\sqrt{c^2}$

$a = 2$

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

$4 + 5 = c^2$

$9 = c^2$

$c = 3$

center $(2,2)$

V: $(0,2)$ & $(4,2)$

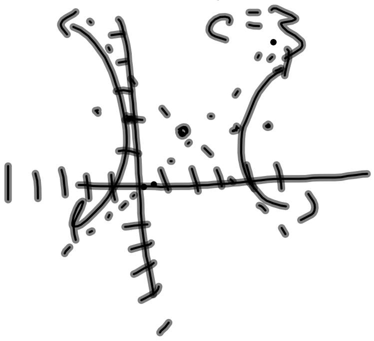
F: $(-1,2)$ & $(5,2)$

A: $k \pm \frac{b}{a}(x-h)$

$2 \pm \frac{\sqrt5}{2}(x-2)$

$y = 2 + \frac{\sqrt5}{2}(x-2) = \frac{\sqrt5}{2}x - .1$

$y = 2 - \frac{\sqrt5}{2}(x-2) = -\frac{\sqrt5}{2}x + 4.1$



Ex 2 Find the center, vertices, foci, and asymptotes:

$\left(\frac{b}{2}\right)^2$

$x^2 - 9y^2 + 36y - 72 = 0$

$x^2 - 9y^2 + 36y = 72$

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

$36 + 4 = c^2$

$40 = c^2$

$c = 2\sqrt{10}$

$x^2 - 9(y^2 - 4y + 4) = 72 - 36$

$\frac{x^2}{36} - \frac{9(y-2)^2}{36} = \frac{36}{36}$

$\frac{x^2}{6^2} - \frac{(y-2)^2}{2^2} = 1$

F: $(-6.3, 2)$ & $(6.3, 2)$

C: $(0,2)$ V: $(-6,2)$ & $(6,2)$

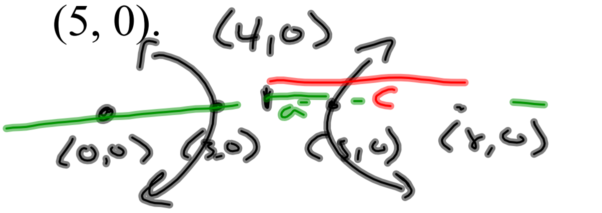
$y = k \pm \frac{b}{a}(x-h)$

$y = 2 \pm \frac{2}{6}(x)$

$y = -\frac{1}{3}x + 2$

$y = \frac{1}{3}x + 2$ $\Leftarrow$ A.

Ex 3 Find the standard form of the equation of the hyperbola with foci at (0, 0) and (8, 0) and vertices at (3, 0) and (5, 0).




$a = 1$

$c = 4$

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

$1 + b^2 = 16$

$b^2 = 15$

$b = \sqrt{15}$

$$\frac{(x-4)}{1} - \frac{(y-0)^2}{15} = 1$$

HOMEWORK

p.687

#1-11, 15-19, 25-27, 31-33 odds