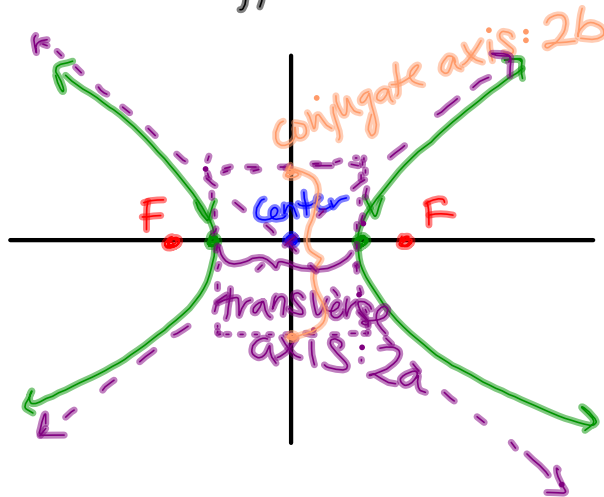


### 8.3 Hyperbolas

Obj: 1. Find the equation, vertices & foci of a hyperbola.



May 7-8:26 AM

### Hyperbolas w/ center (h, k)

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

Foci:  $(h \pm c, k)$        $(h, k \pm c)$

Vertices:  $(h \pm a, k)$        $(h, k \pm a)$

Pythagorean Relation:  $a^2 + b^2 = c^2$        $a^2 + b^2 = c^2$

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

Eccentricity:  $e = \frac{c}{a}$

May 7-9:54 AM

Find the vertices & foci of  $\frac{4x^2}{36} - \frac{9y^2}{36} = \frac{36}{36}$

$$\frac{x^2}{9} - \frac{y^2}{4} = 1 \quad \text{center: } (0,0)$$

$$a=3$$

$$b=2$$

$$9+4=c^2$$

$$c=\sqrt{13}$$

$$V: (h \pm a, k)$$

$$= (\pm 3, 0)$$

$$F: (h \pm c, k)$$

$$= (\pm\sqrt{13}, 0)$$

May 7-10:00 AM

Find V & F :  $\frac{x^2}{16} - \frac{y^2}{7} = 1$

center: (0,0)

$$a=4$$

$$b=\sqrt{7}$$

$$16+7=c^2$$

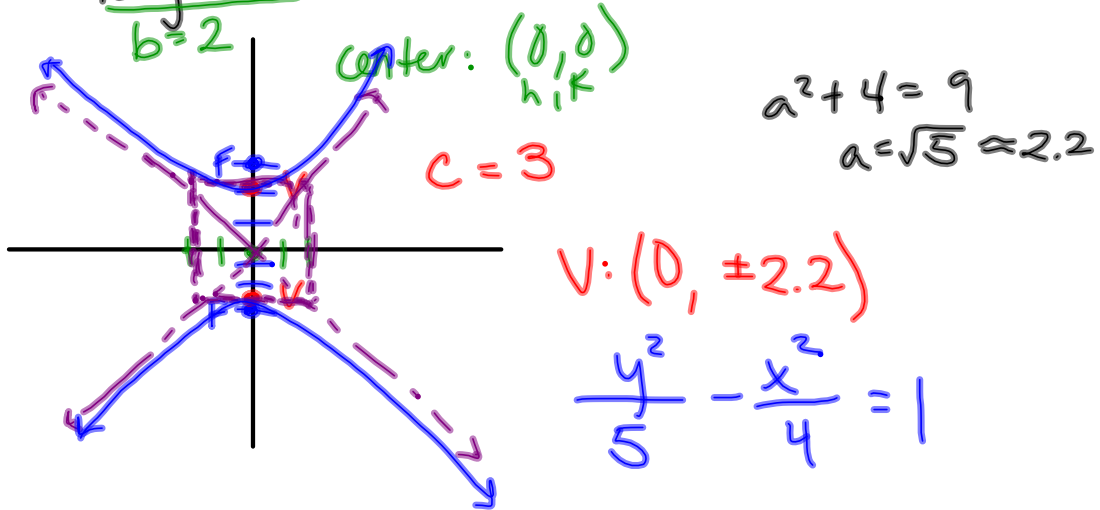
$$c=\sqrt{23}$$

$$V: (\pm 4, 0)$$

$$F: (\pm\sqrt{23}, 0)$$

May 7-10:03 AM

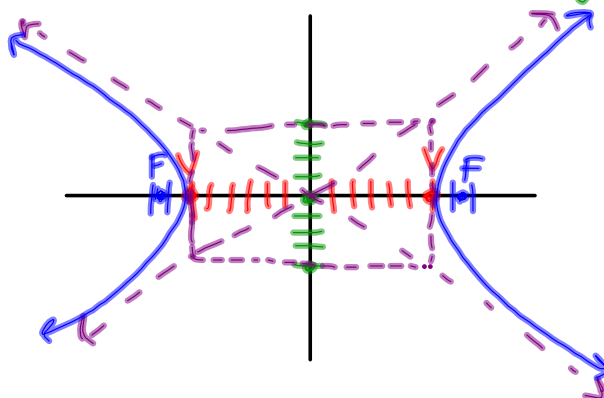
Find an eq. of the hyperbola w/ foci  
 $(0, -3)$   $(0, 3)$  with conjugate axis  
length 4. Then sketch.



May 7-10:05 AM

Sketch by hand:  $\frac{x^2}{36} - \frac{y^2}{16} = 1$

$a=6$   
 $b=4$   
 $36 + 16 = c^2$   
 $c = \sqrt{52} \approx 7.2$   
 center:  $(0, 0)$   
 $V: (\pm 6, 0)$   
 $F: (\pm 7.2, 0)$   
 conjugate axis:  $2b = 8$



May 7-10:11 AM

Find the eq. in standard form for:

$$9x^2 - 4y^2 - 36x + 8y - 4 = 0$$

$$(9x^2 - 36x) + (-4y^2 + 8y) = 4$$

$$9(x^2 - 4x) - 4(y^2 - 2y) = 4$$

$$9(x^2 - 4x + (-2)^2) - 4(y^2 - 2y + (-1)^2) = 4 + 36 + (-4)$$

$$\frac{9(x-2)^2}{36} - \frac{4(y-1)^2}{36} = \frac{36}{36}$$

$$\frac{(x-2)^2}{4} - \frac{(y-1)^2}{9} = 1$$

May 7-10:18 AM