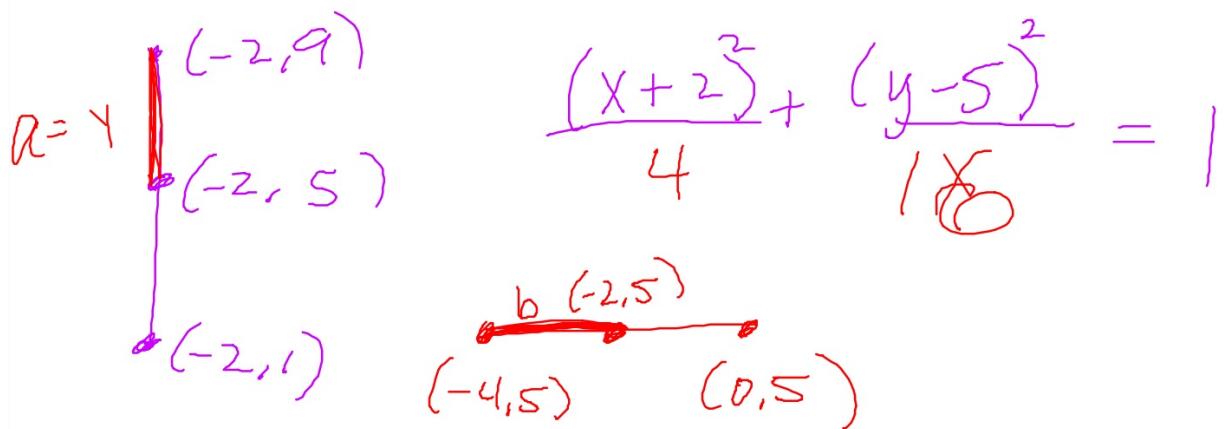


$$2c) x^2 + y^2 - 10x - 6y + 25 = 0$$

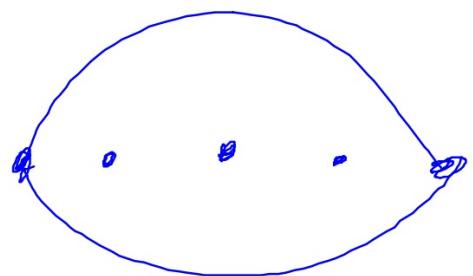
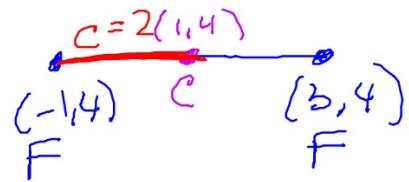
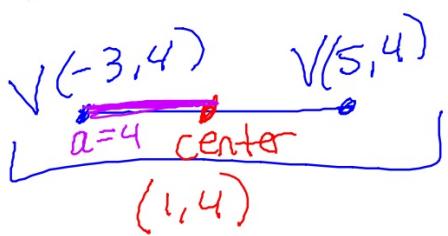
$$x^2 - 10x + \boxed{25} + y^2 - 6y + \boxed{9} = -25 + \frac{25}{+9}$$

$$(x-5)^2 + (y-3)^2 = 9$$

$$18.) \quad V(-2, 1) (-2, 9)$$
$$CV(-4, 5) (0, 5)$$



17.)



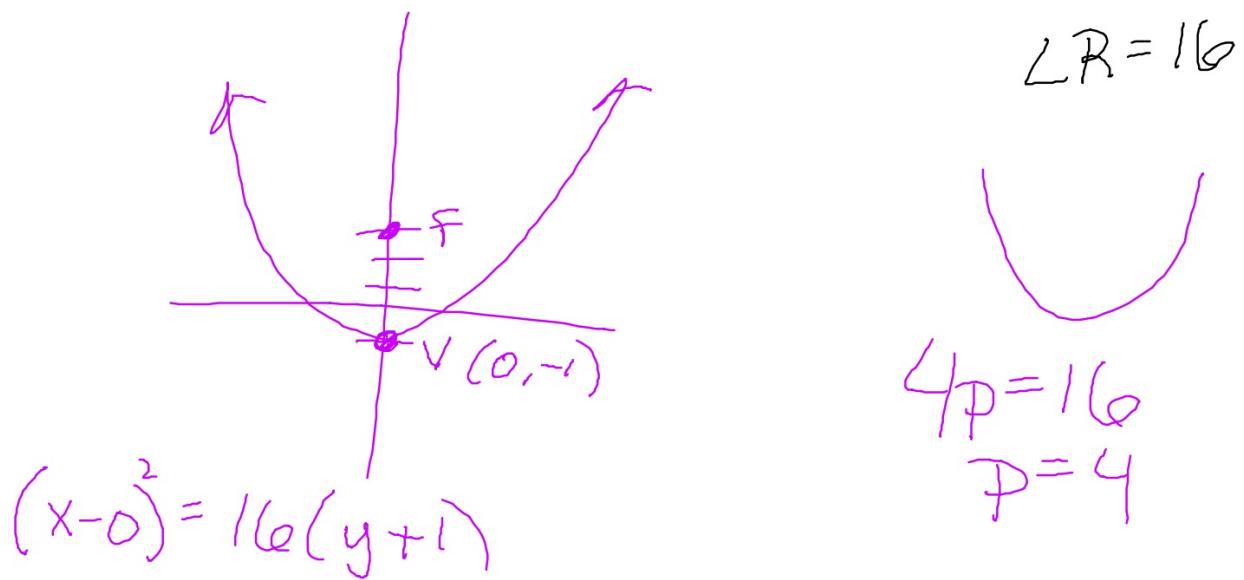
$$\frac{(x-1)^2}{16} + \frac{(y-4)^2}{12} = 1$$

$$c^2 = a^2 - b^2$$

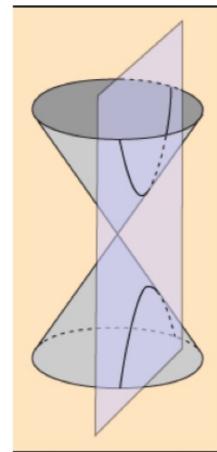
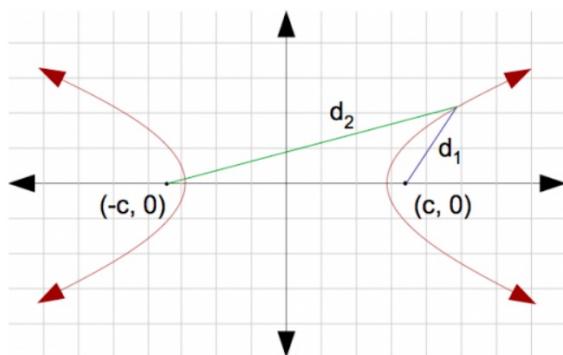
$$4 = 16 - b^2$$

$$12 = b^2$$

7b.) focus  $(0, 3)$ , even function  $p > 0$



Hyperbolas: the set of points such that the difference of the distances from the hyperbola to the foci is a constant

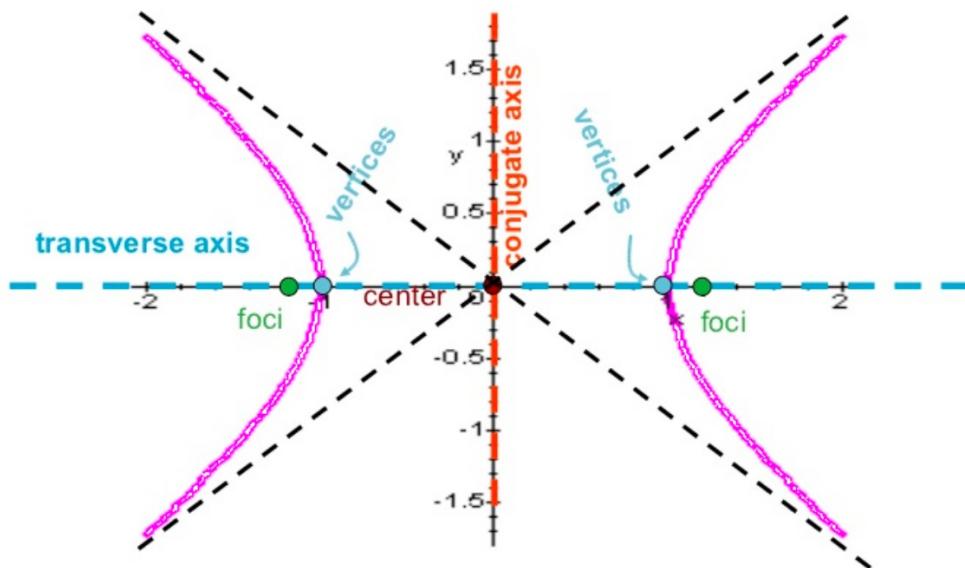


## Standard Form of a Hyperbola

Horizontal Hyperbola ( $x^2$ comes first)	Vertical Hyperbola ( $y^2$ comes first)
<p>At <math>(0, 0)</math>: <math>\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1</math></p> <p>General: <math>\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1</math></p> $a^2 + b^2 = c^2$ <p>Center: <math>(h, k)</math> Foci: <math>(h \pm c, k)</math></p> <p>Vertices: <math>(h \pm a, k)</math> Co-Vertices: <math>(h, k \pm b)</math></p> <p>Asymptotes: <math>y - k = \pm \frac{b}{a}(x - h)</math></p>	<p>At <math>(0, 0)</math>: <math>\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1</math></p> <p>General: <math>\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1</math></p> $a^2 + b^2 = c^2$ <p>Center: <math>(h, k)</math> Foci: <math>(h, k \pm c)</math></p> <p>Vertices: <math>(h, k \pm a)</math> Co-Vertices: <math>(h \pm b, k)</math></p> <p>Asymptotes: <math>y - k = \pm \frac{a}{b}(x - h)</math></p>

## PARTS OF A HYPERBOLA

The black dashes lines are asymptotes for the graphs.



Given a hyperbola, state the foci, vertices, and asymptotes.

*vertical hyperbola*

$$\frac{(y-2)^2}{4} - \frac{x^2}{25} = 1$$

Center:  $(0, 2)$

Vertices  $(0, 4) (0, 0)$

$a=2$

Foci  $(0, 2+\sqrt{29}) (0, 2-\sqrt{29})$

Asymptotes

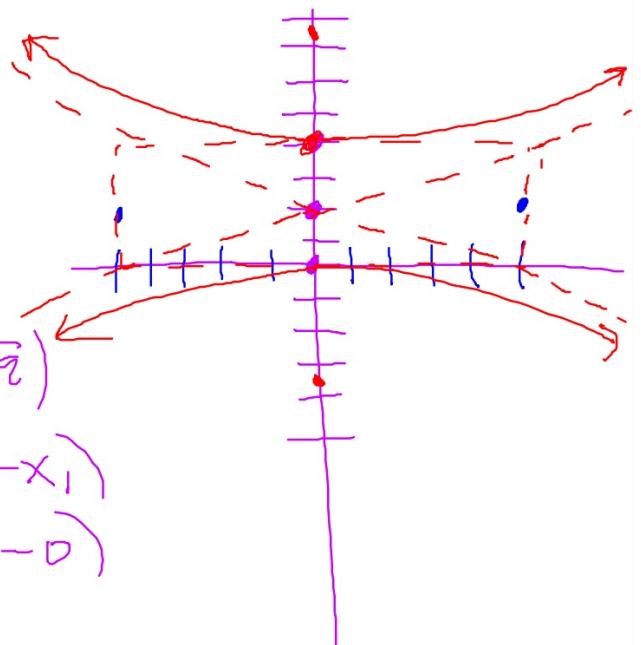
$$y - y_1 = m(x - x_1)$$

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

$$y - 2 = \pm \frac{2}{5}(x - 0)$$

$$c^2 = 4 + 25 = 29$$

$$c = \sqrt{29}$$



Sketch the hyperbola. State the center, vertices, foci, and asymptotes.

Center:  $(3, -1)$  horizontal

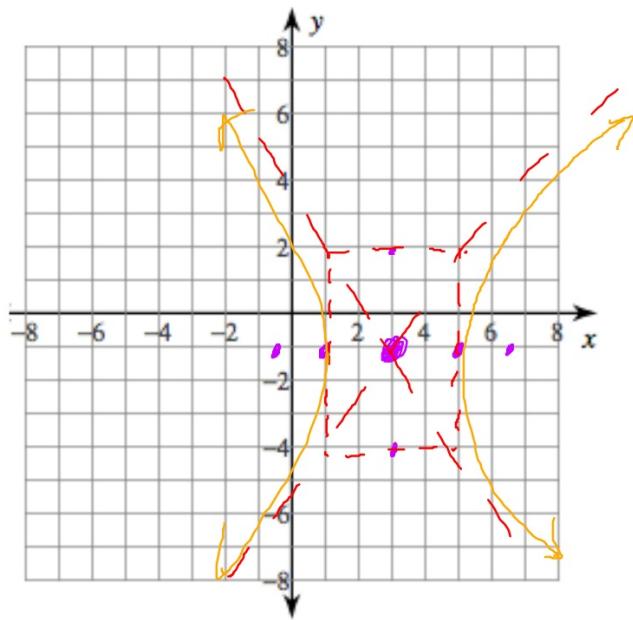
$$\frac{(x-3)^2}{4} - \frac{(y+1)^2}{9} = 1$$

Vertices  $a = 2$   $(1, -1), (5, -1)$

Foci  $c = \sqrt{13}$   $(3 + \sqrt{13}, -1), (3 - \sqrt{13}, -1)$

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

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



Write the standard form of the hyperbola.

$$4x^2 - 9y^2 - 16x + 18y - 65 = 0$$

$$4x^2 - 16x - 9y^2 + 18y = 65$$

$$4(x^2 - 4x + 4) - 9(y^2 - 2y + 1) = 65$$

Now factor out the  
'4' and the '-9'  
and complete the  
square

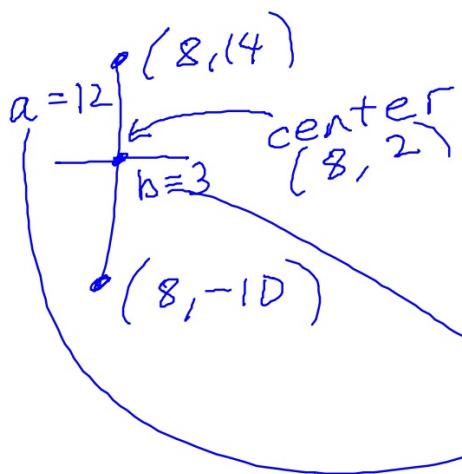
$$\frac{4(x-2)^2}{72} - \frac{9(y-1)^2}{72} = \frac{72}{72}$$

$$\frac{(x-2)^2}{18} - \frac{(y-1)^2}{8} = 1$$

Write the equation of the hyperbola given the characteristics.

Vertices:  $(8, 14), (8, -10)$

Conjugate Axis is 6 units long



$$\frac{(y-2)^2}{144} - \frac{(x-8)^2}{9} = 1$$

*Classify each equation as a parabola, circle, ellipse, hyperbola, or none of these.*

1.  $3x^2 + 2x - y + 3 = 0$  Parabola
2.  $3x^2 + 3y^2 - 12x + 18y - 6 = 0$  circle
3.  $4x^2 + 3y^2 - 12x + 21y - 6 = 0$  ellipse
4.  $3x + 5y - 6 = 0$  none
5.  $2x^2 - y^2 + 5x - 6y + 3 = 0$  hyperbola
6.  $5x^2 + 5y^2 - 3x + 2y - 7 = 0$  circle
7.  $-2x^2 - 3y^2 + 7x - 8y + 2 = 0$  ellipse
8.  $x^2 - 3y + 4 = 0$  Parabola
9.  $x^2 - 2y^2 + 6x - 8y + 2 = 0$  hyperbola

*Review*

*Factor completely.*

$$(a + 1)^{\frac{1}{2}} - a(a + 1)^{-\frac{1}{2}}$$

*Factor completely.*

$$5x^{2n} - 13x^n + 6$$

*Write the equation of the conic in standard form.*

*Sketch.*       $x^2 + 6x - 4y + 1 = 0$

*Write the standard form of the circle with center (3, -5) and passing through (-2, 1)*

*Find the standard form of the ellipse with major vertical axis length 10; length of minor axis 4; center (-2, 3)*

*Find the standard form of the equation of the hyperbola given  
Foci  $(0, -3)$ ,  $(0, 3)$ ; Vertices  $(0, -2)$ ,  $(0, 2)$*