Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

Writing Equations of
HYPERBOLAS

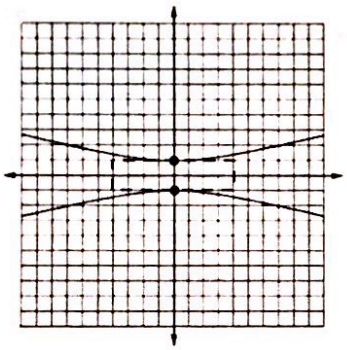
Standard Form for the Equation of a Hyperbola at Vertex (h, k):

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

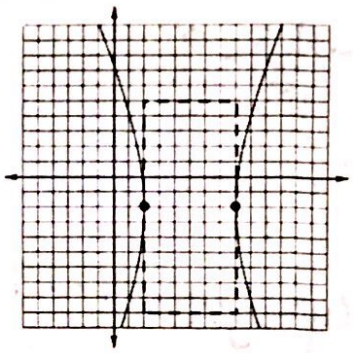
- (h,k) is the center
- a is the distance from the center to the vertices.
- b is the distance from the center to the co-vertices.

SET 1:
Given a Graph

1.



2.



SET 2:
Given Vertices, Co-Vertices, & Foci

Vertices-a
Co-vertices-b
Foci-c

- ✓ Find the **center** (h, k). (Use the midpoint formula with the vert. or co-vert.)
- ✓ Use the **vertices** to find a; Use the **co-vertices** to find b.
  *If given the foci, use the formula $c^2 = a^2 + b^2$ to find the missing part.
- ✓ Determine the direction of the hyperbola to write the equation.

3. a Vertices: $(\pm 5, 0)$ $(5,0)(-5,0)$
b Co-Vertices: $(0, \pm 2)$ $(0,2)(0,-2)$

Center: $\left(\frac{5+-5}{2}, \frac{0+0}{2}\right) = (0,0)$

$a = \frac{5--5}{2} = \frac{10}{2} = 5 \quad a^2 = 25$

$b = \frac{2--2}{2} = \frac{4}{2} = 2 \quad b^2 = 4$

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

4 a Vertices: (4, 8) and (4, -8)
b Co-Vertices: (1, 0) and (7, 0)

Center: $\left(\frac{4+4}{2}, \frac{8+-8}{2}\right) = (4,0)$

$a = \frac{8--8}{2} = 8 \quad a^2 = 64$

$b = \frac{1-7}{2} = -3 \quad b^2 = 9$

$\frac{y^2}{64} - \frac{(x-4)^2}{9} = 1$

5. Vertices: (12, -6) and (-2, -6)
Co-Vertices: (5, -12) and (5, 0)

6. Vertices: (-9, 3) and (-9, -5)
Co-Vertices: (1, -1) and (-19, -1)

7. Vertices: $(0, \pm 3)$
Foci: $(0, \pm \sqrt{73})$

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

$4 + b^2 = 9$

$b^2 = 5$

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

8. Vertices: (2, 5) and (6, 5)
Foci: (1, 5) and (7, 5)

center: $\left(\frac{2+6}{2}, \frac{5+5}{2}\right) = (4, 5)$

$a = \frac{2-6}{2} = -2 \quad a^2 = 4$

$c = \frac{1-7}{2} = -3 \quad c^2 = 9$

9. Vertices: (1, -9) and (-7, -9)
Foci: (2, -9) and (-8, -9)

10. Vertices: (3, -2) and (3, 10)
Foci: $(3, 4 \pm 2\sqrt{10})$

11. Co-Vertices: (5, -3) and (-7, -3)
Foci: (-1, 7) and (-1, -13)

12. Co-Vertices: (-2, 0) and (-2, 10)
Foci: $(-2 \pm \sqrt{51}, 5)$