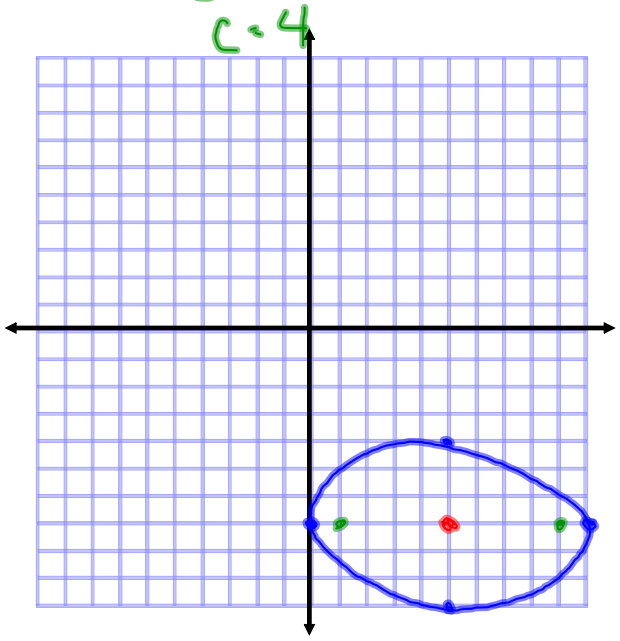
Warm-Up:
Find and graph the foci. Then graph the ellipse.

$$\frac{(x-5)^2}{25} + \frac{(y+7)^2}{9} = 1$$

$25 - 9 = c^2$
$16 = c^2$
$c = 4$

C: (5, -7)

Foci: (1, -7) (9, -7)



30, 40, 28

28) endpts of minor at (0,5) (0,-5)
foci at (12,0) (-12,0)

C: (0,0)
b = 5
c = 12

$a^2 - 25 = 144$
$a^2 = 169$
$a = 13$

$$\frac{x^2}{169} + \frac{y^2}{25} = 1$$

30) $x^2 + 6y^2 - 2x + 12y - 23 = 0$

$x^2 - 2x + 6y^2 + 12y = 23$

$x^2 - 2x + 1 + 6(y^2 + 2y + 1) = 23 + 1 + 6$

$$\frac{(x-1)^2}{30} + \frac{6(y+1)^2}{30} = \frac{30}{30}$$

$$\frac{(x-1)^2}{30} + \frac{(y+1)^2}{5} = 1$$

40) circle
endpts of diameter (5,-9) (3,11)

$C: \left(\frac{5+3}{2}, \frac{-9+11}{2}\right)$

C: (4, 1)

$r = \sqrt{(3-4)^2 + (11-1)^2}$

$r = \sqrt{1 + 100}$

$r = \sqrt{101}$

$$(x-4)^2 + (y-1)^2 = 101$$

Section 10-5: Hyperbolas

A hyperbola is the set of all the points that are the positive difference between two fixed points called the foci.

A hyperbola has two axes of symmetry, the transverse axis (whose length is 2a units) and the conjugate axis (whose length is 2b units).

When the transverse axis is horizontal:

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

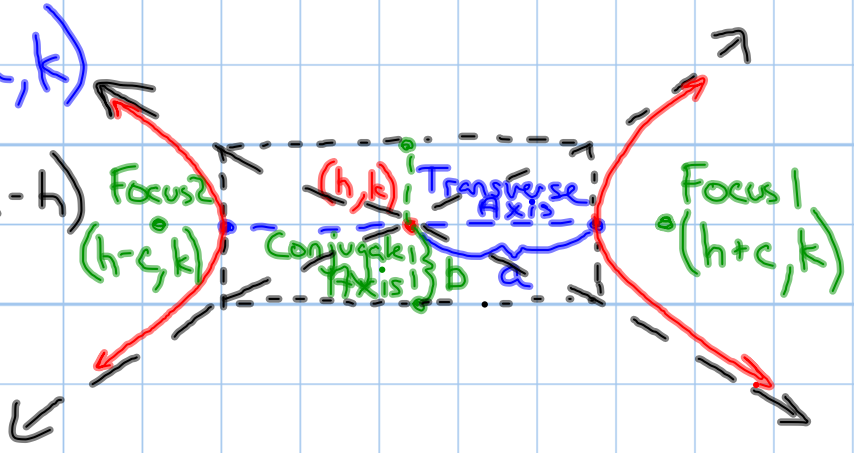
Note: $a^2 + b^2 = c^2$

Opens Left / Right

Center: (h,k)

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

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



When the transverse axis is vertical:

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

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

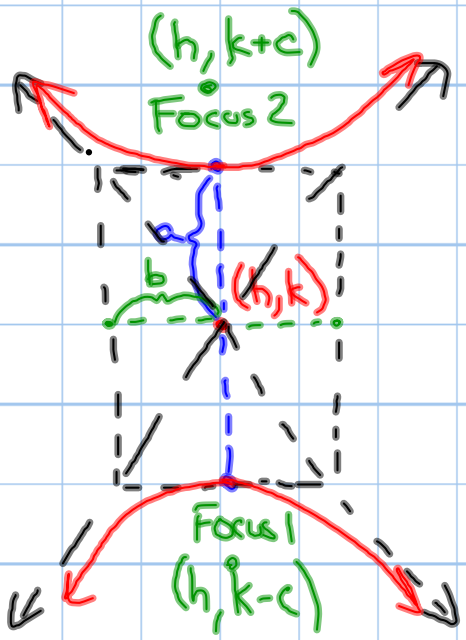
Opens Up Down

Center: (h,k)

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

Asymptotes:

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



Examples:

1) Find the coordinates of the vertices and foci and the equations of the asymptotes for the hyperbola with the given equation. Then graph.

$x^2 - y^2 = 1$

$a = 1$

$b = 1$

C: (0,0)

Vertices: $(\pm 1, 0)$

Asymptotes:

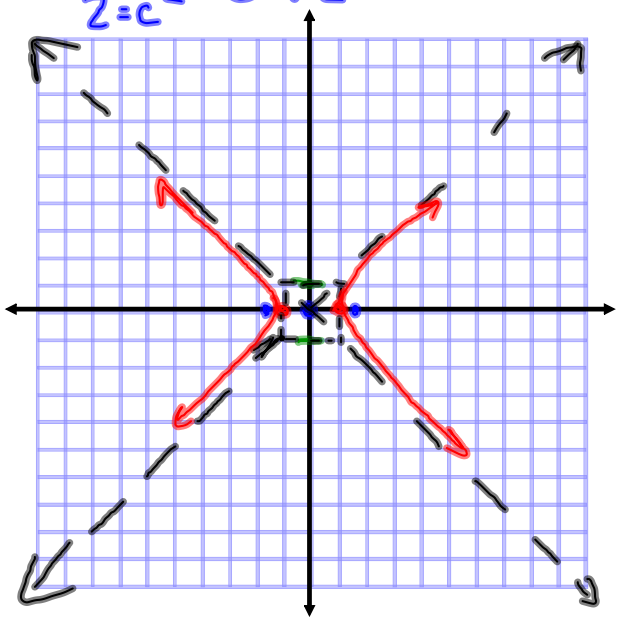
$y = \pm 1(x)$

Foci: $(\pm\sqrt{2}, 0)$

$1 + 1 = c^2$

$2 = c^2$

$c = \sqrt{2}$



Examples:

2) Find the coordinates of the vertices and foci and the equations of the asymptotes for the hyperbola with the given equation. Then graph.

$\frac{(x-2)^2}{16} - \frac{(y+4)^2}{25} = 1$

$a = 4$

$b = 5$

$16 + 25 = c^2$

$41 = c^2$

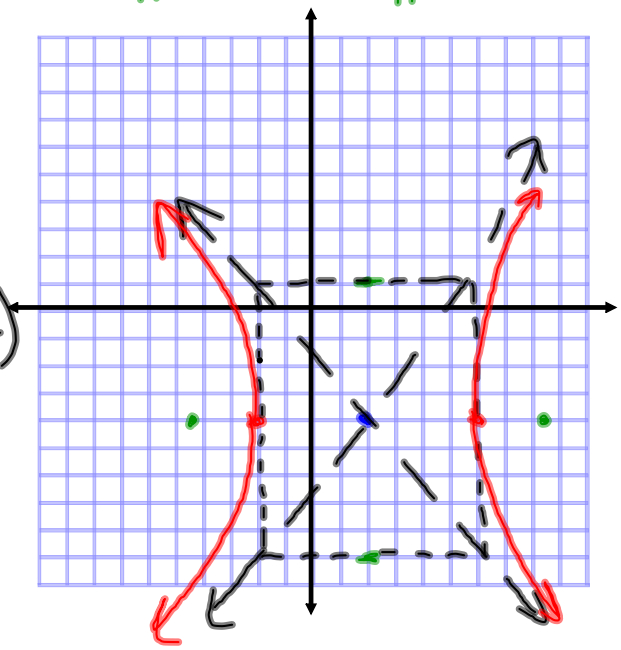
$c = \sqrt{41}$

C: $(2, -4)$

Vertices: $(6, -4)(-2, -4)$

Asymptotes: $y + 4 = \pm\frac{5}{4}(x - 2)$

Foci: $(2 \pm \sqrt{41}, -4)$



Examples:

3) Find the coordinates of the vertices and foci and the equations of the asymptotes for the hyperbola with the given equation. Then graph.

$x^2 - y^2 + 6x + 10y - 17 = 0$

$x^2 + 6x - y^2 + 10y = 17$

$x^2 + 6x + 9 - 1(y^2 - 10y + 25) = 17 + 9 - 25$

$(x + 3)^2 - (y - 5)^2 = 1$

Homework: pg. 595-596 #16-28 even, 32, 36-38 all

Section 10-5 Vocab