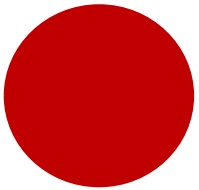
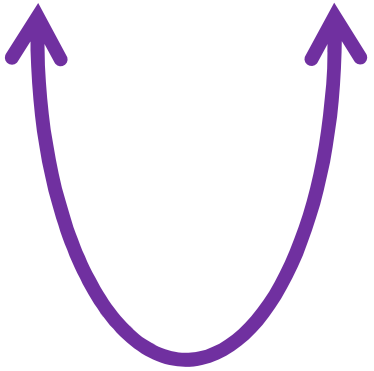
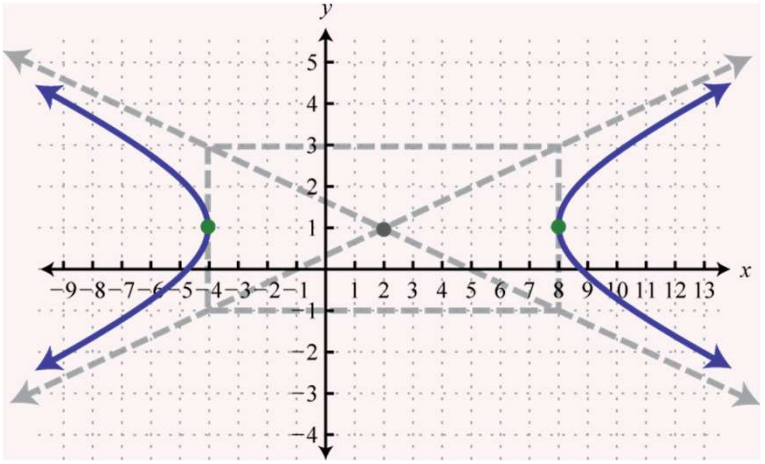
Ch. 11 Shifted Conics



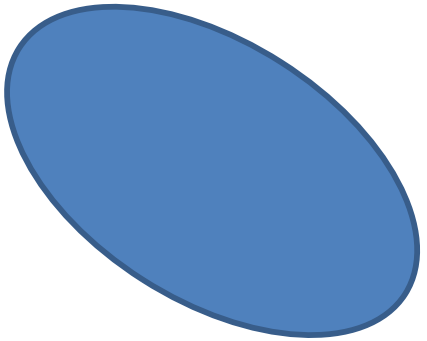
Circle



Parabola

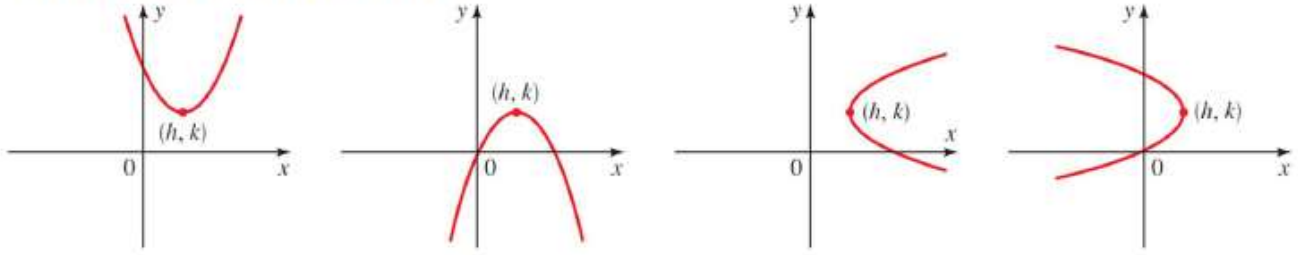


Ellipse



Hyperbola

Shifted Parabolas



(a) $(x-h)^2 = 4p(y-k)$, $p>0$ (b) $(x-h)^2 = 4p(y-k)$, $p<0$ (c) $(y-k)^2 = 4p(x-h)$, $p>0$ (d) $(y-k)^2 = 4p(x-h)$, $p<0$

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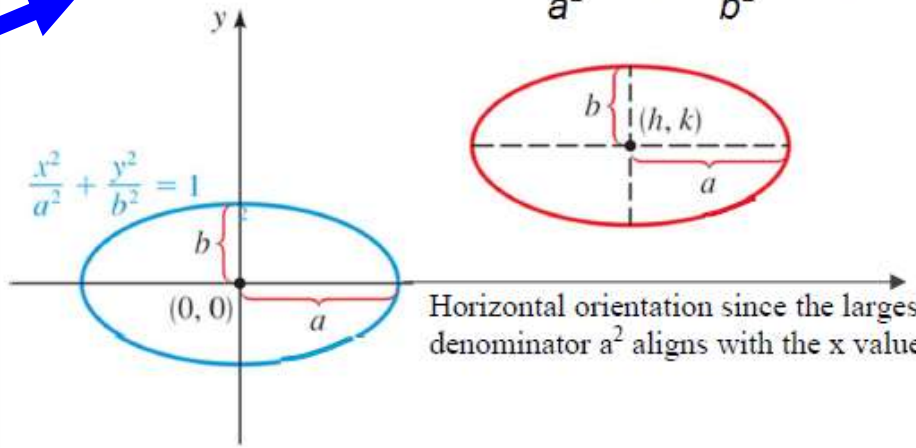
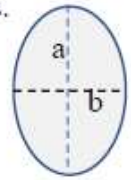
Shifted Ellipses

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



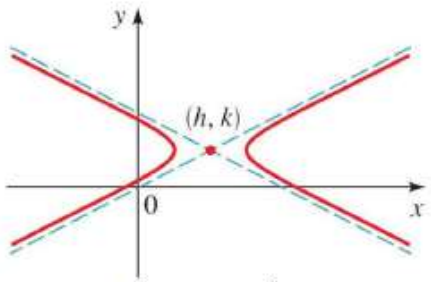
Horizontal orientation since the largest denominator a^2 aligns with the x values.

NOTE: the ellipse will have vertical orientation if the largest denominator a^2 aligns with the y values.

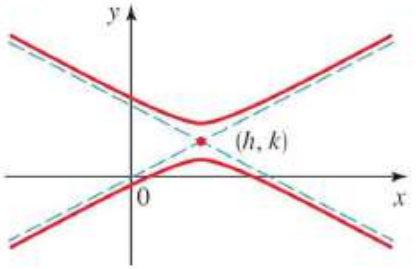


$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$$

Shifted Hyperbolas

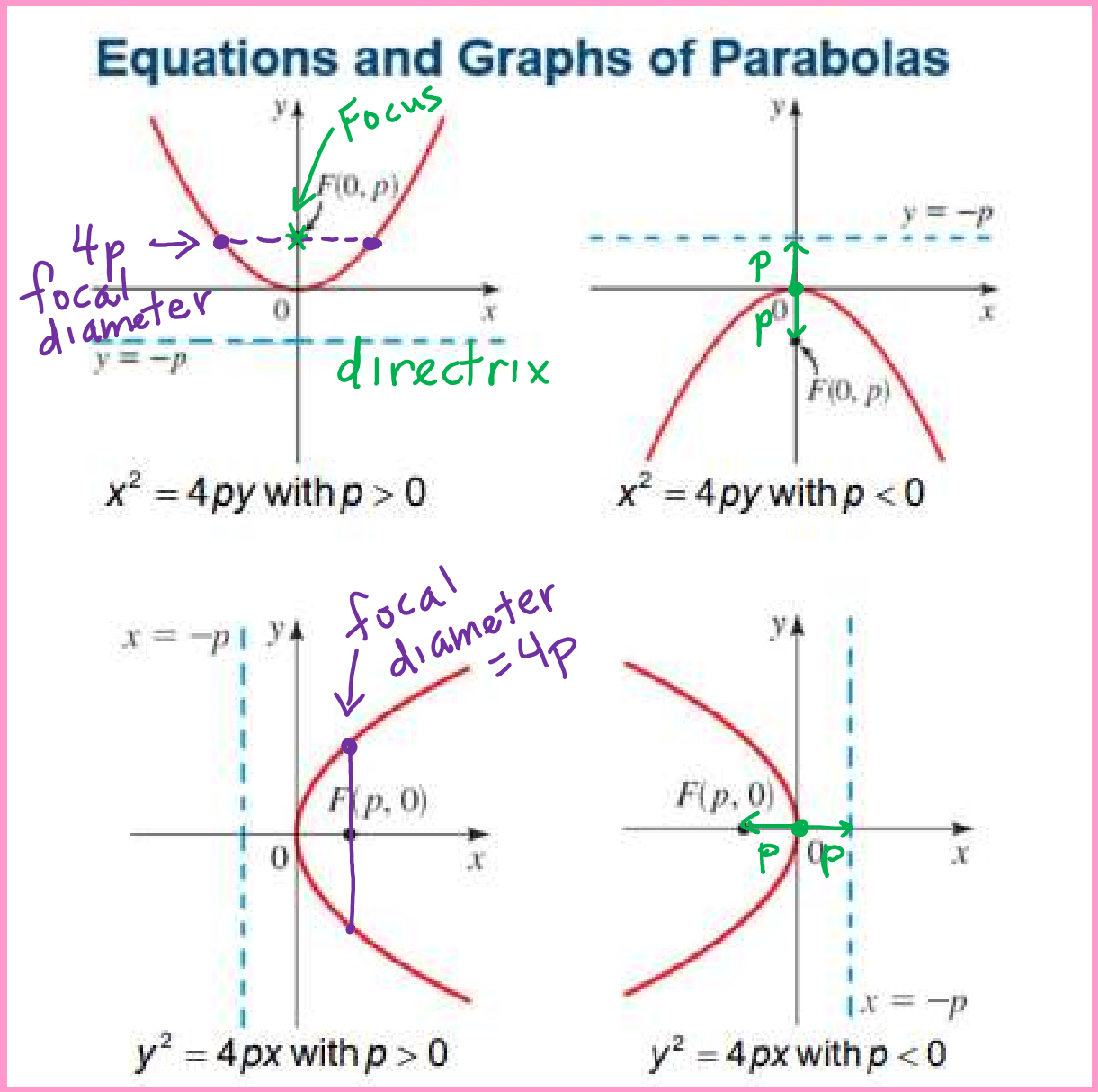


$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$



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

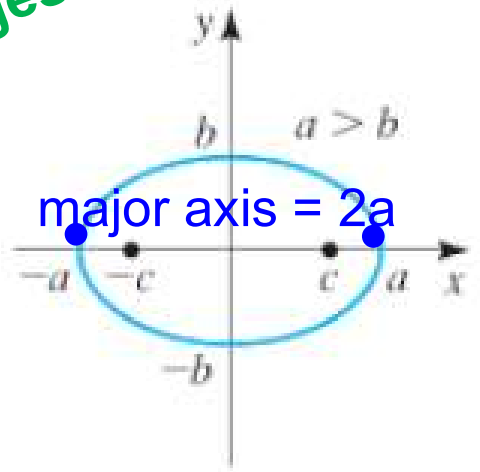
11.1 notes previously added to pink sheet:



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

horizontal $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

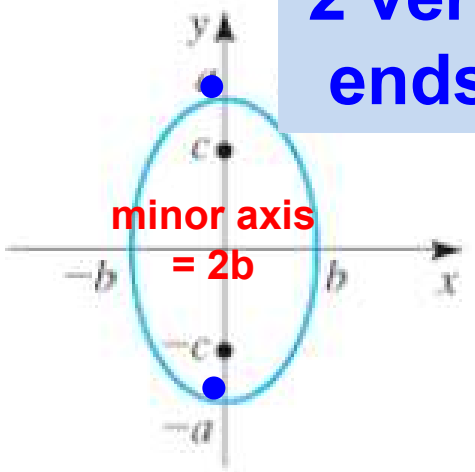
largest → a



Foci $(\pm c, 0)$, $c^2 = a^2 - b^2$

vertical

$\frac{x^2}{b^2} + \frac{y^2}{a^2}$ ← largest



Foci $(0, \pm c)$, $c^2 = a^2 - b^2$

2 vertices always at ends of major axis

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

2 foci located on major axis

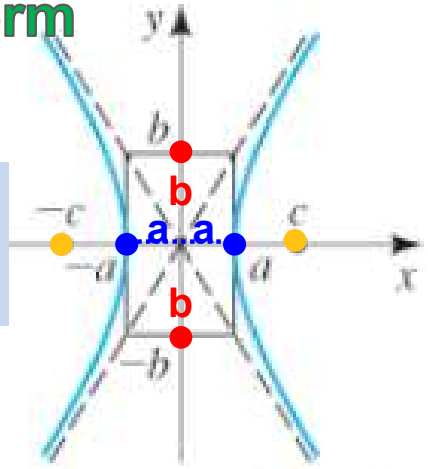
"c" units from the center

11.2 notes previously added to pink sheet

$y = \pm \frac{b}{a} x$ **Asymptotes** $y = \pm \frac{a}{b} x$

Horizontal orientation because x term is positive

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

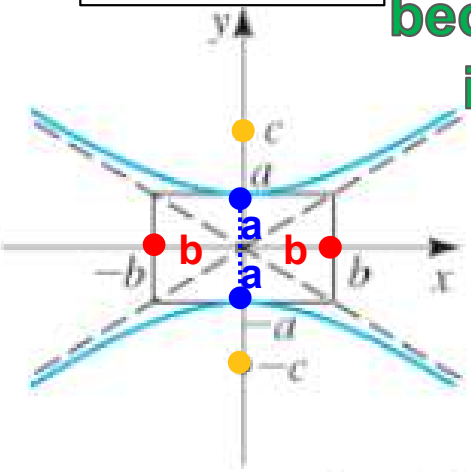


Foci $(\pm c, 0)$, $c^2 = a^2 + b^2$

transverse axis = 2a

Vertical orientation because y term is positive

$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$



Foci $(0, \pm c)$, $c^2 = a^2 + b^2$

2 vertices always at ends of the transverse axis

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

2 foci located on transverse axis "c" units from the center

11.3 notes previously added to pink sheet

Today's assignment:

11.4 #2, 5, 7, 9, 13, 15

21, 23, 35-41odd

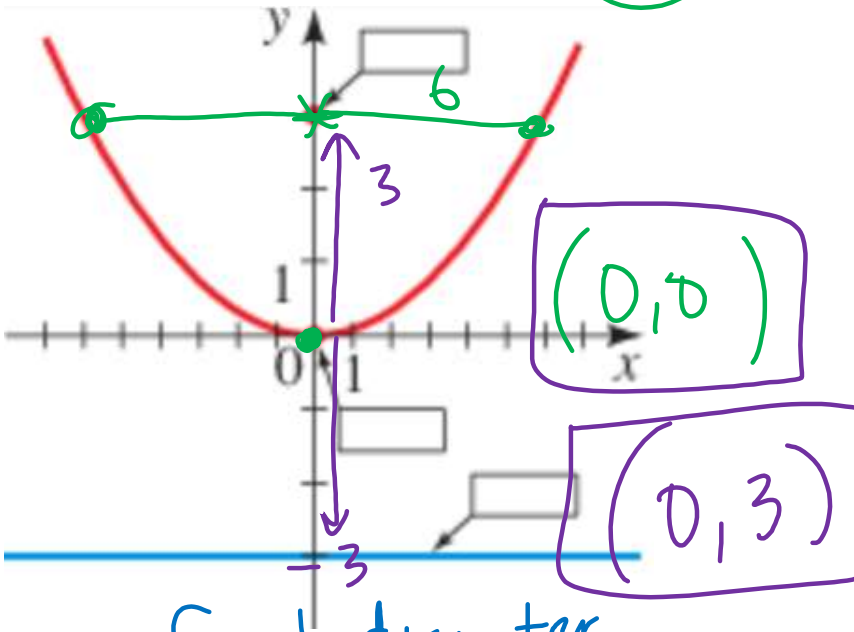
Show work!

Label each part that you identify.

A rough sketch may be helpful for #35-41odd.

Label the vertex, focus, and directrix:

2. (a) $x^2 = 12y$ (4p)



Vertex $(0,0)$

Focus $(0,3)$

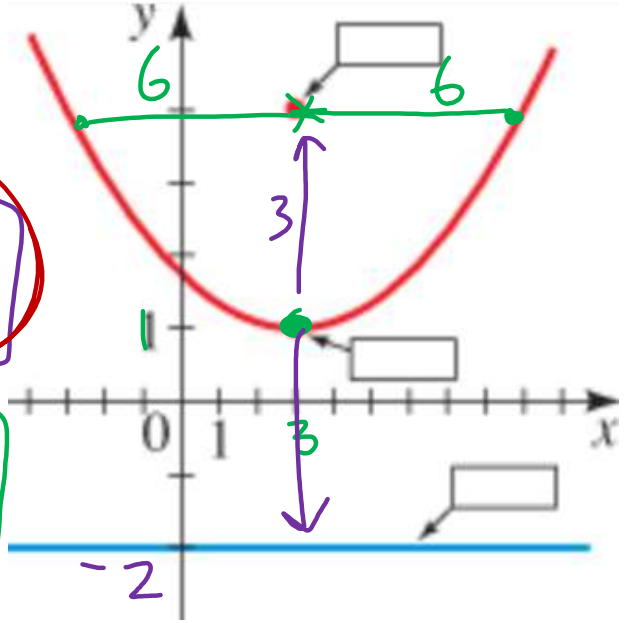
Directrix $y=-3$

focal diameter

$4p = 12$

$p = 3$

(b) $(x-3)^2 = 12(y-1)$ (h, k)



Vertex $(3,1)$

Focus $(3,4)$

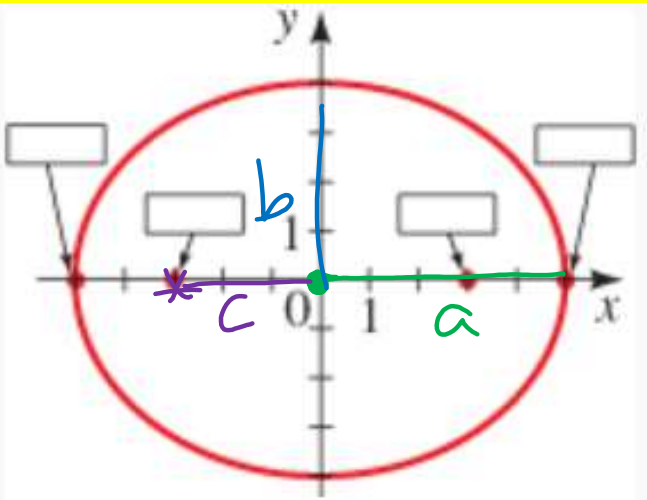
Directrix $y=-2$

$(3, 1 \pm 3)$

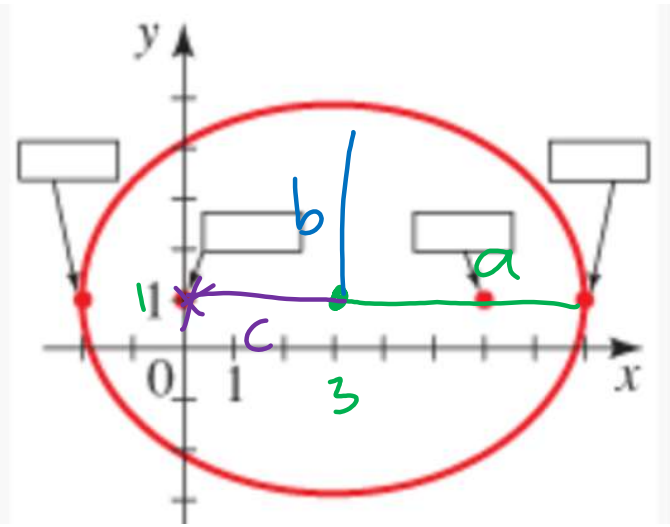
Don’t solve #3 and 4, just compare graphs before moving on to #5

3.

$$\frac{x^2}{5^2} + \frac{y^2}{4^2} = 1$$



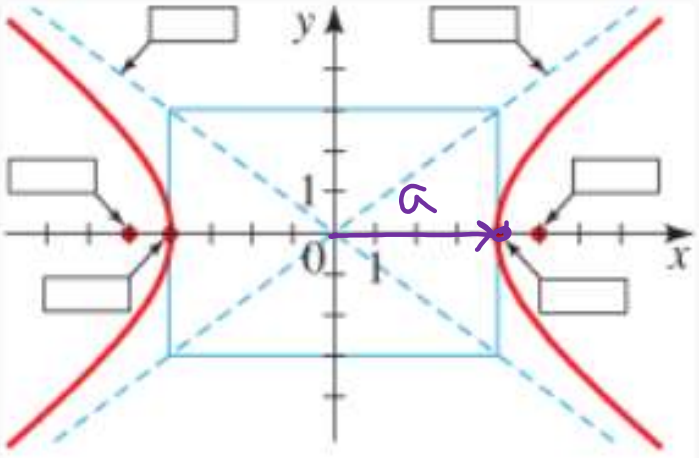
$$\frac{(x-3)^2}{5^2} + \frac{(y-1)^2}{4^2} = 1$$



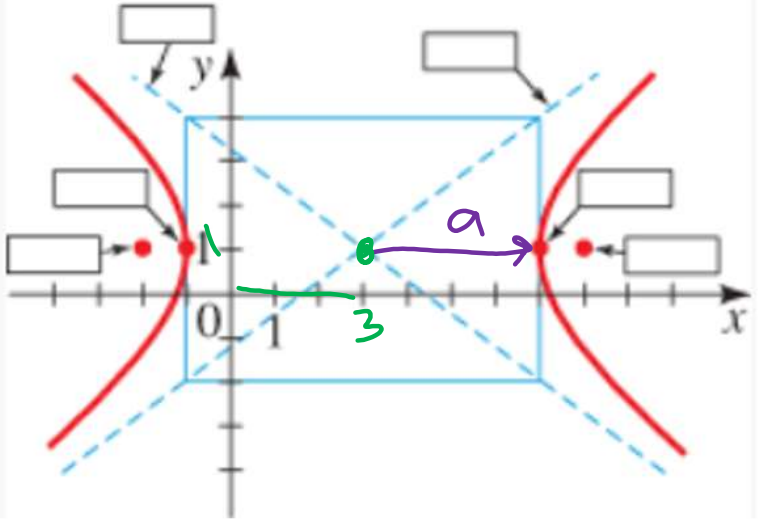
Don’t solve #3 and 4, just compare graphs before moving on to #5

4.

$$\frac{x^2}{4^2} - \frac{y^2}{3^2} = 1$$



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



11.4 #5

(h,k) = (2,1)

(a) Identify the **center**, vertices, foci of the ellipse.

(b) Determine lengths of the major and minor axes.

(c) Sketch graph using **a** and **b** values.

5. $\dfrac{(x-2)^2}{a^2\,9} + \dfrac{(y-1)^2}{4\,b^2} = 1$

h = 2, k = 1

largest

$a = 3$ ↔

$b = 2$ ↕

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

$c^2 = 9 - 4$

$c^2 = 5$

$c = \sqrt{5}$

Vertices

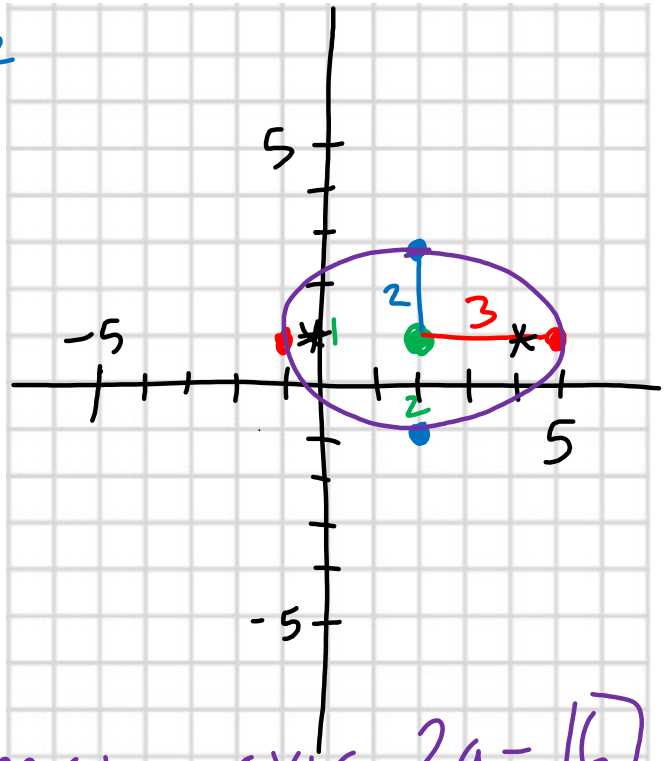
(5,1) (−1,1)

or $(2 \pm 3, 1)$

foci

$(2+\sqrt{5}, 1)$

$(2-\sqrt{5}, 1)$



major axis $2a = 6$

minor axis $2b = 4$

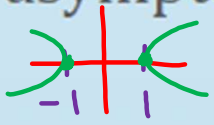
Hints for previous assignment 11.3

37–50 Finding the Equation of a Hyperbola Find an equation for the hyperbola that satisfies the given conditions.

41. Vertices: $(\pm 1, 0)$, asymptotes: $y = \pm 5x$

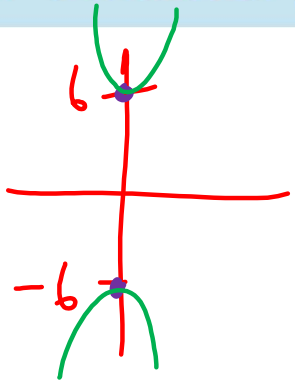
$a = 1$

horizontal



$y = \pm \frac{b}{a} x$

43. Vertices: $(0, \pm 6)$, hyperbola passes through $(-5, 9)$



$a = 6$

x y

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

$$\frac{9^2}{36} - \frac{(-5)^2}{b^2} = 1$$

Hints for previous assignment 11.3

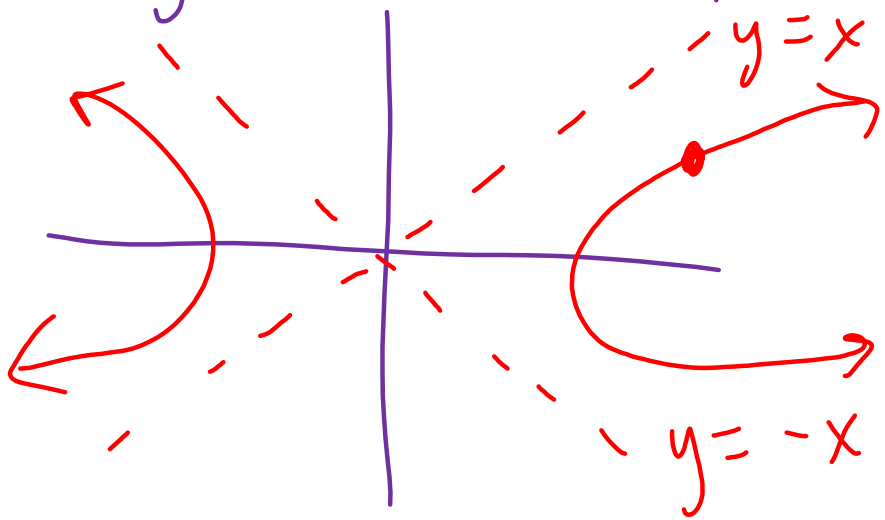
37–50 Finding the Equation of a Hyperbola Find an equation for the hyperbola that satisfies the given conditions.

45. Asymptotes: $y = \pm x$, hyperbola passes through $(5, 3)$

$y = 1x$ $\quad y = -x$ $\quad \frac{b}{a}$ $\quad \frac{a}{b}$ $\quad a = b$ $\quad x\ y$

~~47. Foci: $(0, \pm 3)$, hyperbola passes through $(1, 4)$~~ ok to skip #47

rough sketch is helpful



$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

(5) (3) $b^2 = a$