

Precalc 10.4

Use and determine standard and general forms for hyperbolas

Graph hyperbolas

hyperbola

focus (foci)

center

vertex

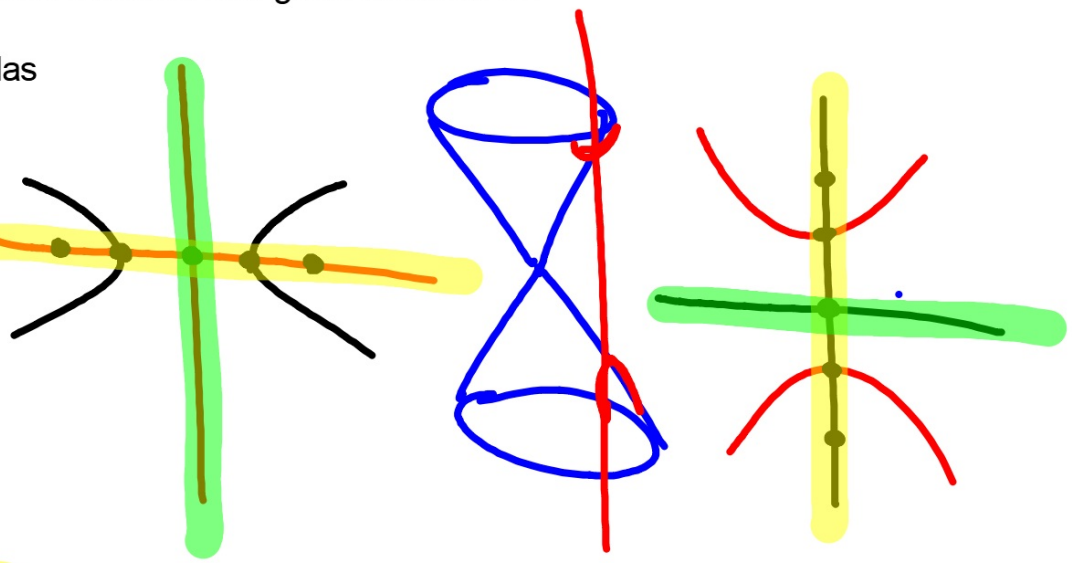
asymptotes

transverse axis

conjugate axis

eccentricity

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



activity: playdoh?

Ellipse:

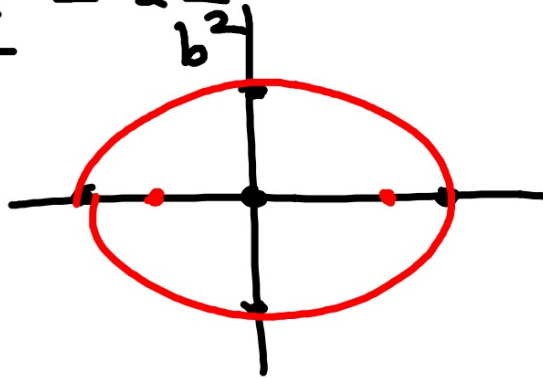
center

foci

vertices

standard form

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



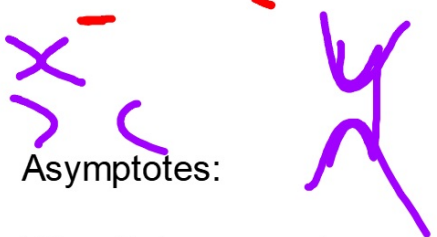
What is different?

transverse
C(0,0)

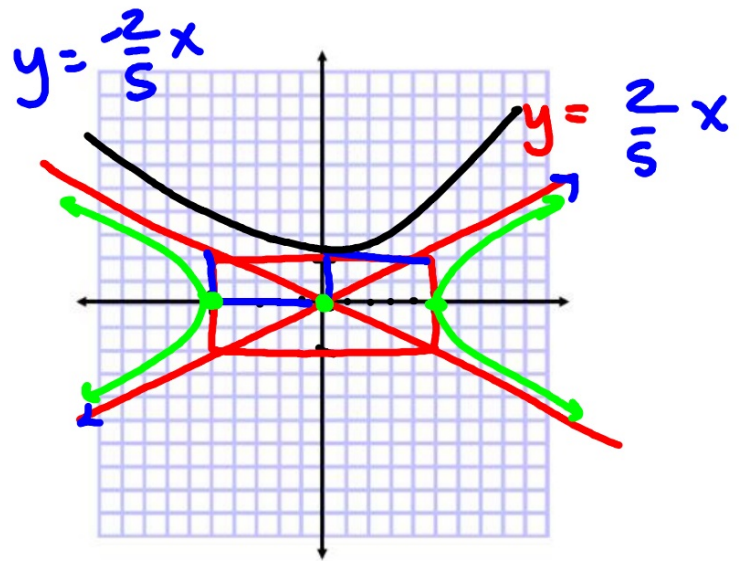
$$5 \cdot \frac{x^2}{25} - \frac{y^2}{4} = 1$$

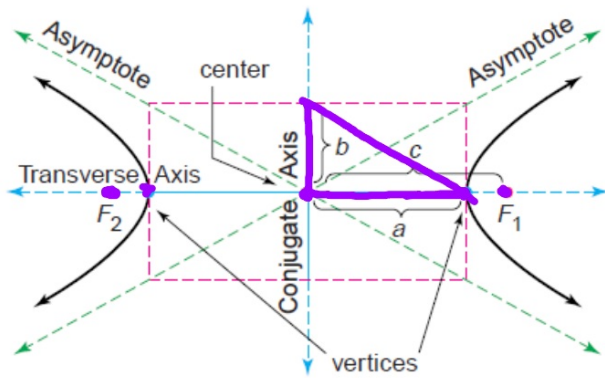
$a=5$ $b=2$

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



What if the center is not at (0,0)?
Wider, narrower, etc.?





Note that $c > a$ for the hyperbola.

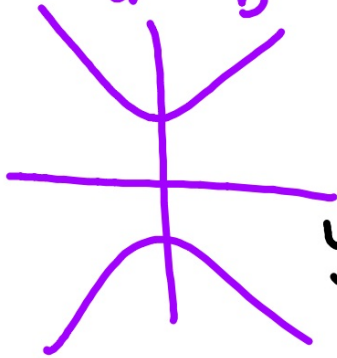
$$e = \frac{c}{a} > 1$$

which variable is positive?
determines which way to open

stupid Kroon trick:

$$6. \frac{(y-3)^2}{16} - \frac{(x-2)^2}{4} = 1 \quad c(2,3)$$

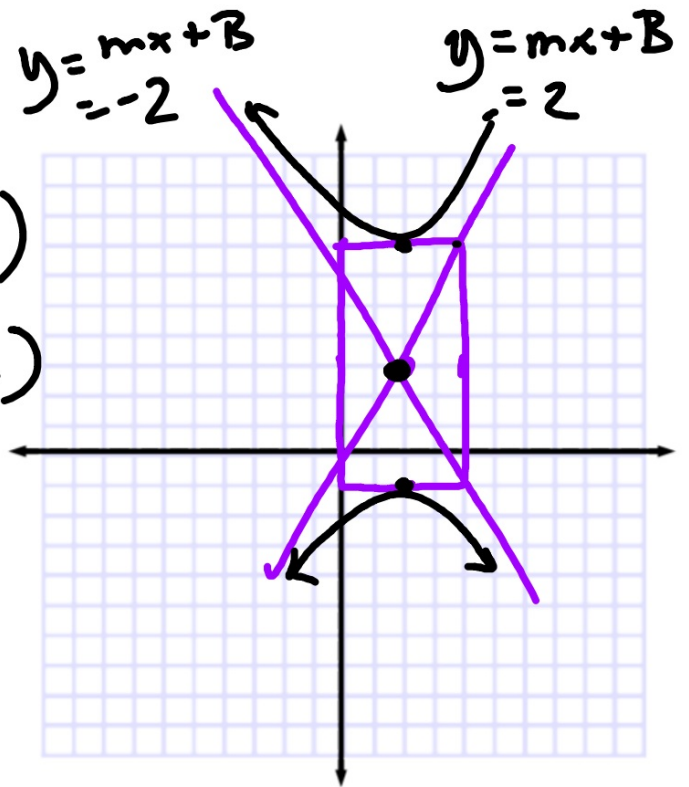
\downarrow \downarrow
 a^2 b^2



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

$$y - 3 = \pm 2(x - 2)$$

Asymptotes: point-slope form



point-slope form

- 2 Find the coordinates of the center, foci, and vertices, and the equations of the asymptotes of the graph of $\frac{(y+4)^2}{36} - \frac{(x-2)^2}{25} = 1$. Then graph the equation.



$$y+4 = \pm \frac{6}{5}(x-2)$$

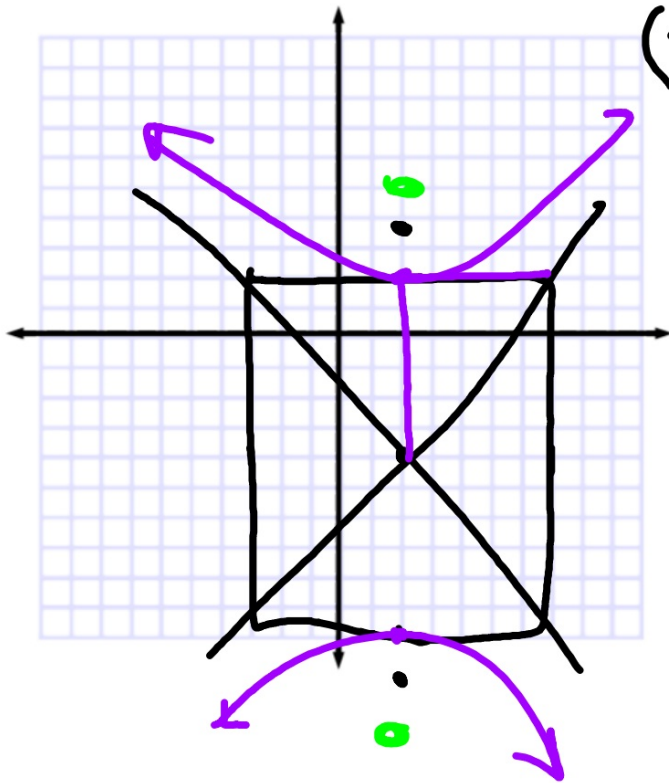
$$a=6 \quad b=5$$

$$C(2, -4)$$

$$F(2, -4 \pm \sqrt{61})$$

$$V(2, 2)$$

$$V(2, -10)$$

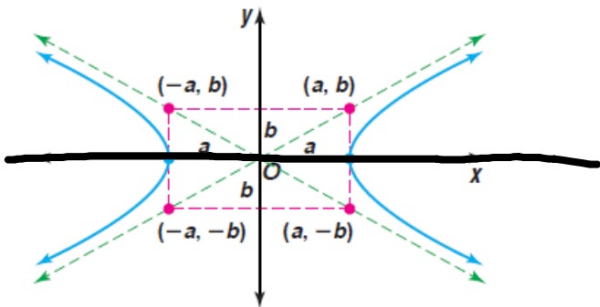


$$a^2 + b^2 = c^2$$

$$36 + 25 = c^2$$

$$61 = c^2$$

$$\pm \sqrt{61} = c$$



$$(x \quad)^2 - (\quad)^2 = 1$$

transverse axis
conjugate axis

- 1 Find the equation of the hyperbola with foci at (7, 1) and (-3, 1) whose transverse axis is 8 units long.

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

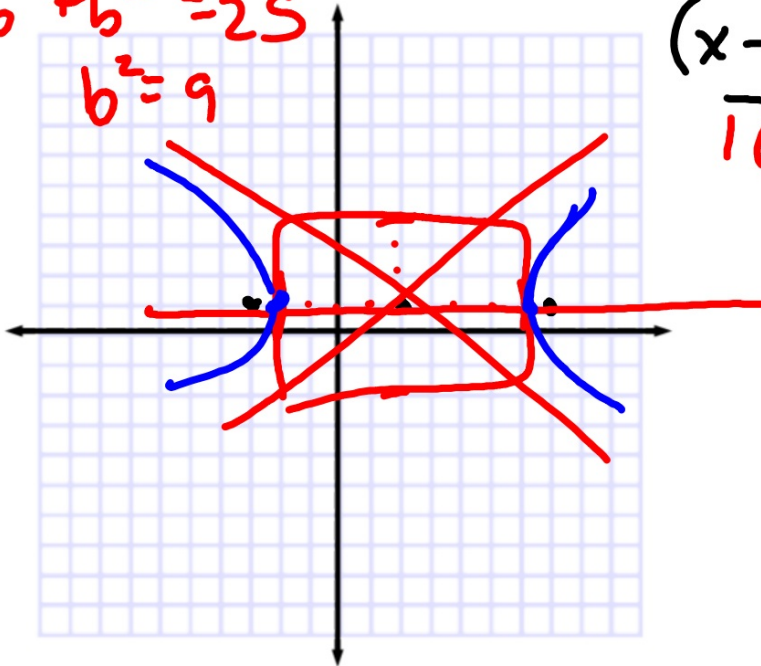
$$16 + b^2 = 25$$

$$b^2 = 9$$

$$\frac{7 + (-3)}{2} = \frac{4}{2}$$

One picture is worth 1000 words...

$$\frac{(x-2)^2}{16} - \frac{(y-1)^2}{9} = 1$$



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