

Day 3: Stretching Conics

Reminder - The general form of a conic:

$$Ax^2 + Cy^2 + Dx + Ey + F = 0$$

Standard Form:

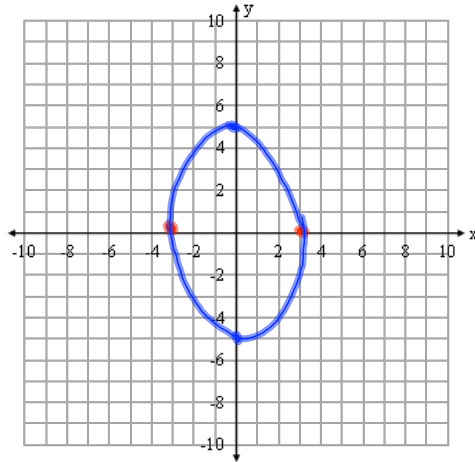
$$\frac{x^2}{a^2} \pm \frac{y^2}{b^2} = 1$$

Changing from one form to the other:

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

ellipse

x-int
y-int



$$\frac{x^2}{9} + \frac{y^2}{25} = 1$$

$$\frac{4x^2}{36} + \frac{9y^2}{36} = \frac{36}{36} \leftarrow$$

$$\frac{x^2}{9} + \frac{y^2}{4} = 1$$

$$\frac{225x^2}{9} + \frac{225y^2}{25} = 225$$

General form
eliminate
fractions

$$25x^2 + 9y^2 = 225$$

$$25x^2 + 9y^2 - 225 = 0$$

Investigate Pg. 535 #1

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

\swarrow a
 \nwarrow b

What information about the graph of

$$\left(\frac{x}{a}\right)^2 + \left(\frac{y}{b}\right)^2 = 1$$

do "a" and "b" provide??

asymptotes

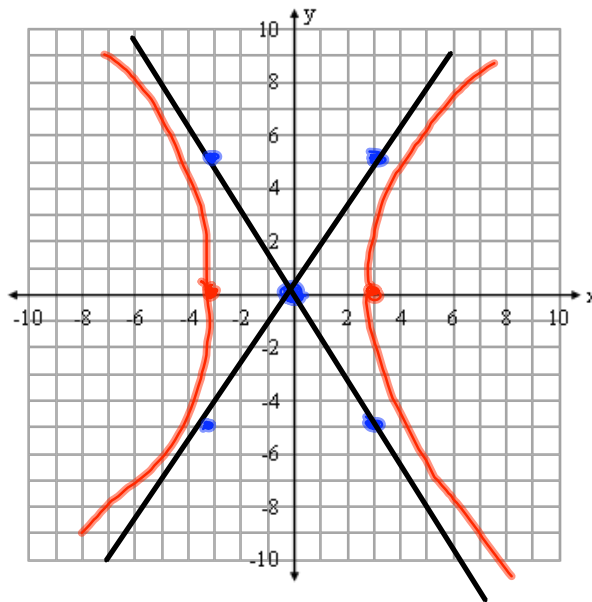
$$y = \pm \frac{b}{a} x$$

$$y = \pm \frac{5}{3} x$$

hyperbola
 open left and right
 Center (0, 0)
 Vertices (3, 0)
 (-3, 0)

Major axis: The longest axis of the ellipse**Minor axis:** The shortest axis of the ellipse

Sketch the graphs of the equations Pg. 535 #4



$$y = +\frac{5}{3}x$$

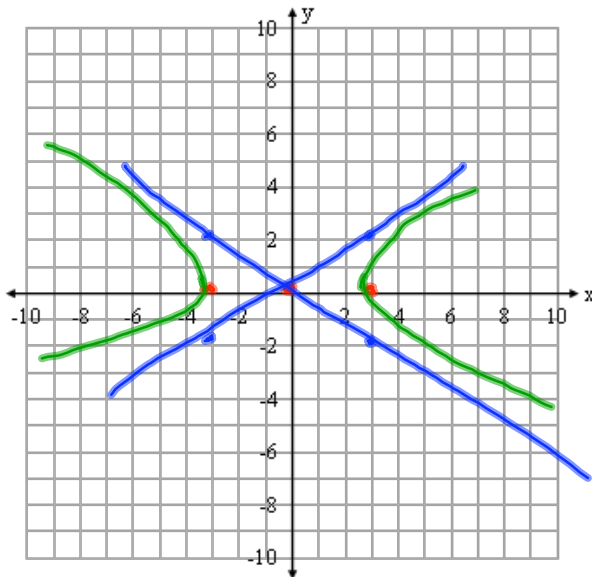
Slope

$$\frac{\text{rise}}{\text{run}} = +\frac{5}{3}$$

5
3

Let's graph $\frac{x^2}{9} - \frac{y^2}{4} = 1$

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



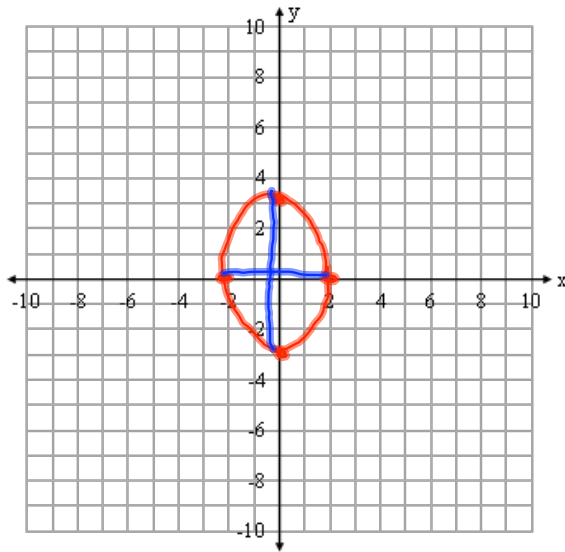
Center: $(0,0)$

Vertices: open left & right
 $(3,0)$ $(-3,0)$

Asymptotes: $y = \pm \frac{2}{3}x$

The equation of the asymptotes is $y = \pm \frac{b}{a}x$

Eg 1) Describe the conic section defined by $9x^2 + 4y^2 = 36$ and sketch.



ellipse

$$\frac{x^2}{4} + \frac{y^2}{9} = 1$$

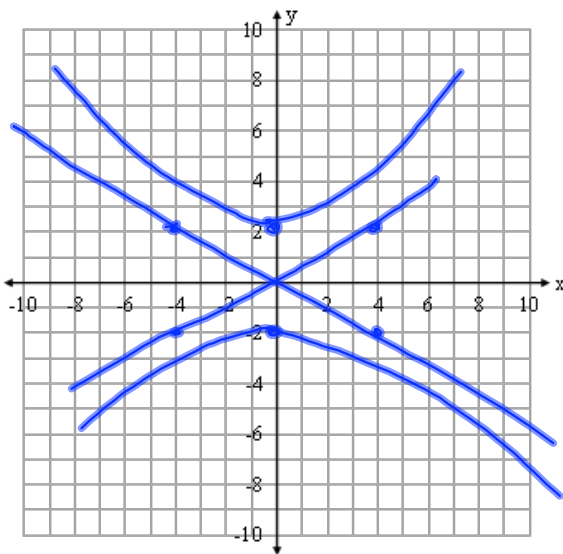
$$\underline{x\text{-int: } \pm 2}$$

$$\underline{y\text{-int: } \pm 3}$$

major axis: 6 units

minor axis: 4 units

Eg 2) Describe the conic section defined by $x^2 - 4y^2 + 16 = 0$ and sketch.



Hyperbola

$$\frac{x^2}{-16} - \frac{4y^2}{-16} = \frac{-16}{-16}$$

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

Center: (0,0)

vertices: (0, ±2)

asymptotes: $y = \pm \frac{2}{4}x$

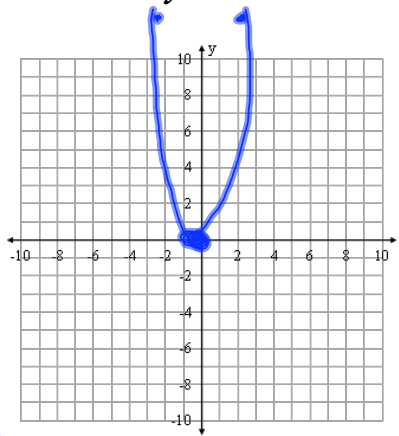
Sketch each of the following and summarize the effect of a on $y = ax^2$ and on $x = ay^2$.

$$y = 3x^2 \quad \text{up}$$

vertex $(0,0)$

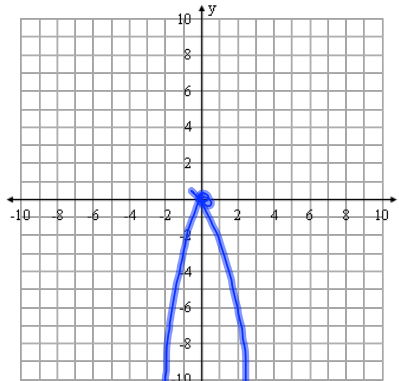
$$y = 3(2)^2$$

$$y = 12 \quad \underline{(2,12)}$$



Picked
an x
value
2 units
from our
vertex.

$$y = -3x^2 \quad \text{down}$$

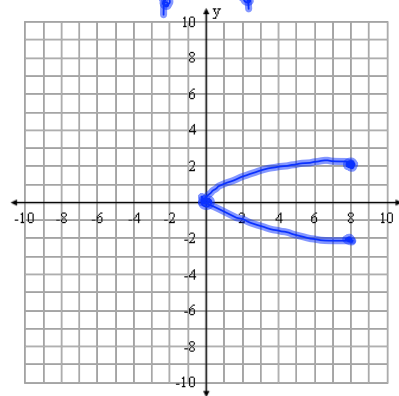


$$x = 2y^2 \quad \text{right}$$

$$x = 2(2)^2$$

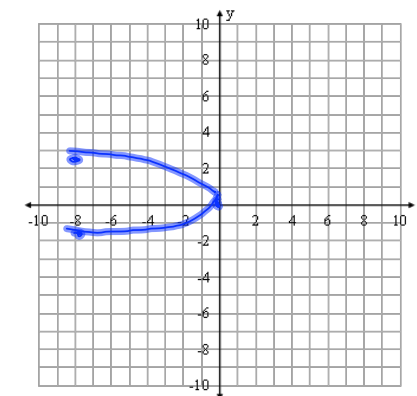
$$x = 8$$

$$(8,2)$$



Pick
 y value

$$x = -2y^2 \quad \text{left}$$



Assignment:
Pg. 542 6, 7, 13, 14 odds, 15 odds