Sections 8.2,8.3: Ellipses and Hyperbolas

Friday, April 04, 2014
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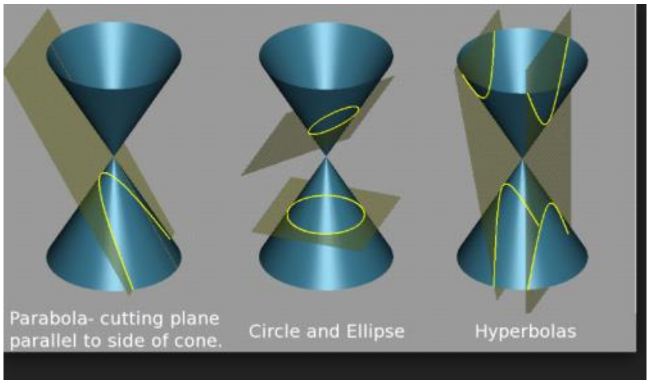
Homework is from the text:

8.2: 9-33 e.o.o.
8.3: 9- 29 e.o.o.
DON'T WORRY ABOUT FINDING FOCI OR EQUATIONS OF ASYMPTOTES FOR HYPERBOLAS



conic sections - Google Search
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Parabola

Standard Equations

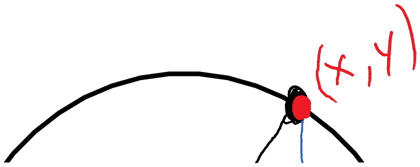
$$(x-h)^2 = 4p(y-k)$$

$V(h,k)$

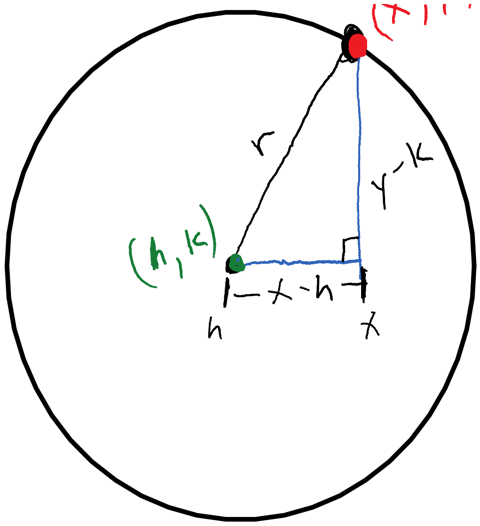
or

$$(y-k)^2 = 4p(x-h)$$

The Standard Equation of a circle



$$\boxed{(x-h)^2+(y-k)^2=r^2}$$



Standard eqn. of a circle with Center (h,k) radius = r

dividing by r^2

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

changing would stretch or compress the circle vertically

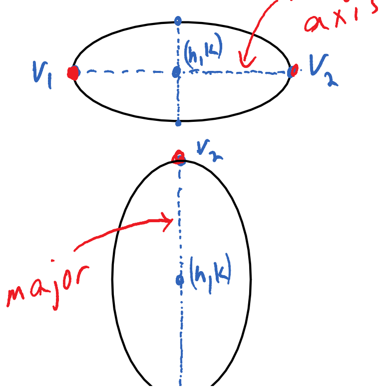
changing would stretch or compress the circle horizontally

Ellipse

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

Std. eqns.

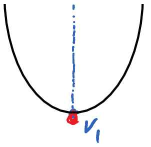
c (h,k)



$a > b$

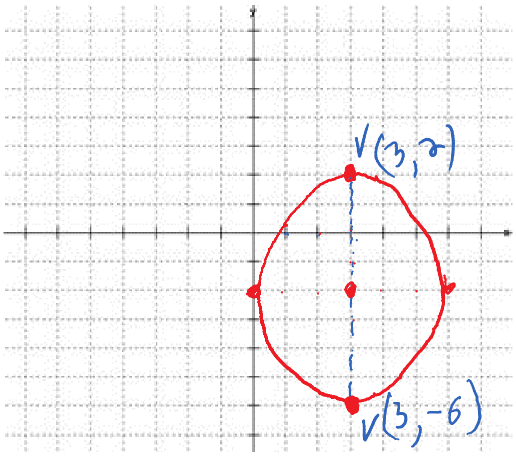
Std. eqns.

$C(h,k)$



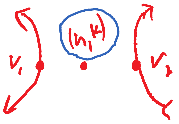
ex Graph $$\frac{\overset{\text{horizontal}}{(x-3)^2}}{\underset{3}{9}} + \frac{\overset{\text{vertical}}{(y+2)^2}}{\underset{4}{16}} = 1$$

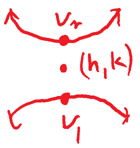
$C(3,-2)$



Hyperbolas

$$\boxed{\begin{array}{l} \rightarrow \dfrac{(x-h)^2}{a^2} - \dfrac{(y-k)^2}{b^2} = 1 \\ \rightarrow \dfrac{(y-k)^2}{a^2} - \dfrac{(x-h)^2}{b^2} = 1 \end{array}}$$



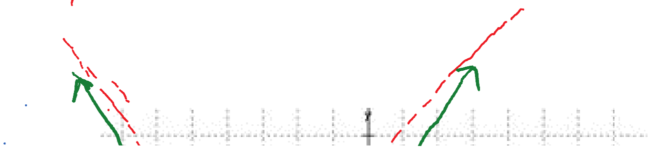


Std. Eqns.

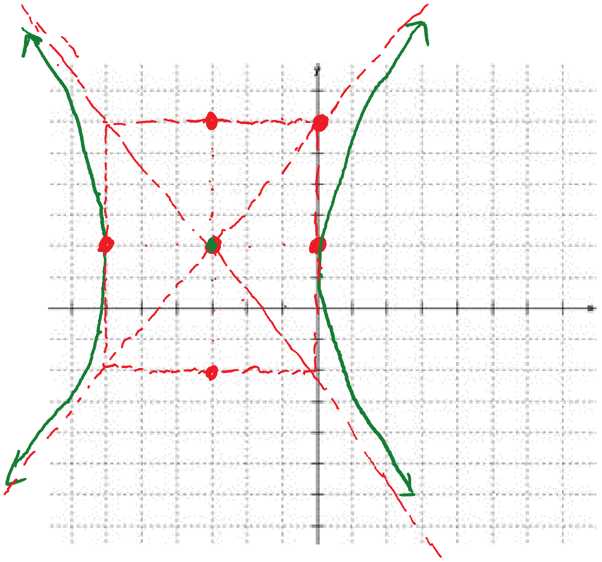
ex Graph $$\frac{\overset{\text{horizontal}}{(x+3)^2}}{9} - \frac{\overset{\text{vertical}}{(y-2)^2}}{16} = 1$$

$a=3$ $b=4$

$C(-3,2)$



C(-3, 2)



Why asymptotes?

Let $\boxed{C(0,0)}$ be center.

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

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

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

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

$$y \approx \pm\sqrt{\frac{b^2}{a^2}x^2}$$ when |x| gets "big"

$$\boxed{y \approx \pm\frac{b}{a}x}$$ ← eqns. of asymptotes if center is (0,0) and positive

$$\boxed{y \approx \pm \frac{b}{a} x}$$ ← eqns. of asy (0,0) and p
center is (0,0) and
term involves x.

(ex) Find the center (or vertex) and identify the conic:

a) $$\underbrace{\overset{\downarrow}{4x^2} + 16x}_{\text{group}} + \underbrace{1\overset{\downarrow}{y^2} - 6y}_{\text{group}} = -21$$

$$\overset{4}{4\left(\underbrace{x^2 + 4x + 2^2}\right)} + y^2 - 6y + 9 = -21 + 16 + 9$$

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

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

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

Ellipse

C(-2,3)

b) $4x^2 - 9y^2 + 24x + 18y + 18 = 0$

$$\underbrace{4x^2+24x}\ -9y^2+18y = -18$$

$$\overbrace{4(x^2+6x+9}^{+36}) - \overbrace{9(y^2-2y+1}^{-9}) = -18+36-9$$

$$\frac{4(x+3)^2}{9} - \frac{9(y-1)^2}{9} = \frac{9}{9}$$

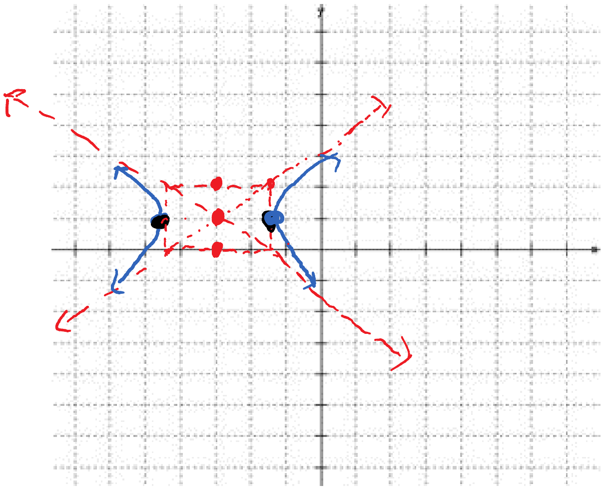
$$\frac{4(x+3)^2}{9} - (y-1)^2 = 1$$

$$\frac{(x+3)^2}{\frac{9}{4}} - \frac{(y-1)^2}{1^2} = 1$$

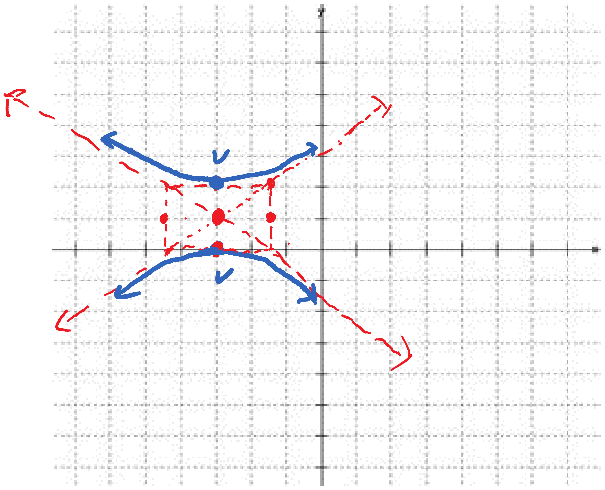
hyperbola

$C(-3,1)$

$\sqrt{\frac{9}{4}} = \frac{3}{2} = 1\frac{1}{2}$



Note: $(y-1)^2 - \frac{(x+3)^2}{9/4} = 1$ graphs as . . .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V
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