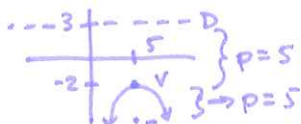


Directions: Practice problems 8, 10, 12, and 22 with and without a calculator.

- 1) Find the focus for a parabola with vertex (5, -2) & directrix  $y = 3$ .

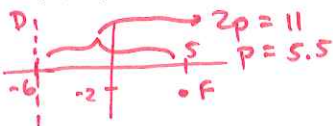
$$\begin{aligned} \text{focus} &= (h, k-p) \\ &= (5, -2-5) \\ &= (5, -7) \end{aligned}$$



vertex: (5, -2)  
focus: (5, -7)

- 2) Find the vertex for a parabola with focus (5, -2) & directrix  $x = -6$ .

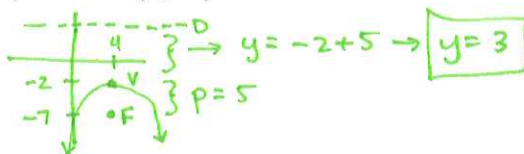
$$\begin{aligned} \text{vertex} &= (5 - 5.5, -2) \\ &= (-0.5, -2) \end{aligned}$$



focus: (5, -2)  
vertex: (-0.5, -2)

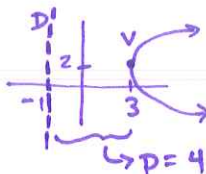
- 3) Find the directrix for a parabola with vertex (4, -2) & focus (4, -7).

$$\begin{aligned} \text{directrix} &: y = k + p \\ &= -2 + 5 \\ &= 3 \end{aligned}$$



- 4) Write the equation for a parabola with vertex (3, 2) & directrix  $x = -1$ .

$$\begin{aligned} (y-k)^2 &= 4p(x-h) \\ (y-2)^2 &= 4(4)(x-3) \\ \text{Equation: } (y-2)^2 &= 16(x-3) \end{aligned}$$

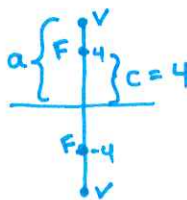


- 5) Find the vertices of an ellipse with foci (0, 4), (0, -4) & minor axis of 6.

$$\begin{aligned} a^2 &= b^2 + c^2 \\ a^2 &= 3^2 + 4^2 \\ a^2 &= 9 + 16 \\ a^2 &= 25 \\ a &= 5 \end{aligned}$$

vertices: (0, 5), (0, -5)

$$\begin{aligned} 2b &= 6 \\ b &= 3 \end{aligned}$$

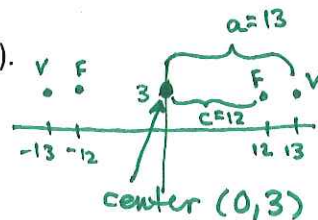


- 6) Write the equation for an ellipse with vertices (13, 3), (-13, 3) & foci (12, 3), (-12, 3).

$$\begin{aligned} \frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} &= 1 \\ \frac{(x-0)^2}{13^2} + \frac{(y-3)^2}{5^2} &= 1 \end{aligned}$$

Equation:  $\frac{x^2}{169} + \frac{(y-3)^2}{25} = 1$

$$\begin{aligned} a^2 &= b^2 + c^2 \\ 13^2 &= b^2 + 12^2 \\ 169 &= b^2 + 144 \\ 25 &= b^2 \\ 5 &= b \end{aligned}$$



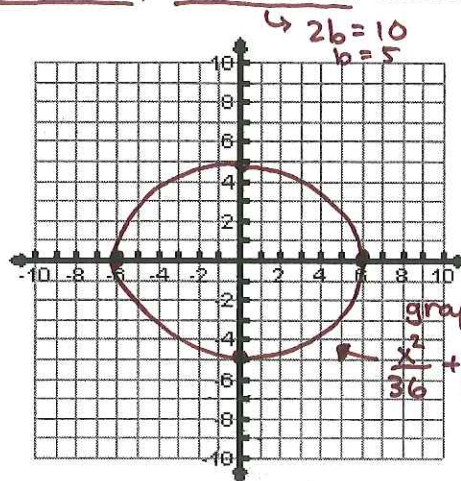
- 7) Draw the graph and write the equation of an ellipse with a major axis of 12, minor axis of 10 & center at the origin.

center (0, 0)

$$\begin{aligned} 2a &= 12 \\ a &= 6 \end{aligned}$$

$$\frac{(x-0)^2}{6^2} + \frac{(y-0)^2}{5^2} = 1 \quad \text{OR} \quad \frac{(y-0)^2}{5^2} + \frac{(x-0)^2}{6^2} = 1$$

Equation:  $\frac{x^2}{36} + \frac{y^2}{25} = 1$  OR  $\frac{y^2}{36} + \frac{x^2}{25} = 1$



graph of:  $\frac{x^2}{36} + \frac{y^2}{25} = 1$

8) Draw & label the graph of  $12x^2 + 4y^2 = 48$ .

center:  $(0,0)$   
 vertices:  $(0, \pm\sqrt{2})$   
 foci:  $(0, \pm\sqrt{8})$

$$\frac{12x^2}{48} + \frac{4y^2}{48} = \frac{48}{48}$$

$$\frac{x^2}{4} + \frac{y^2}{12} = 1$$

$$b^2 = 4 \quad \rightarrow \quad a^2 = 12$$

$$b = 2 \quad \rightarrow \quad a = \sqrt{12}$$

$\sqrt{9} < \sqrt{12} < \sqrt{16}$   
 $3 < \sqrt{12} < 4$   
 ... 😊

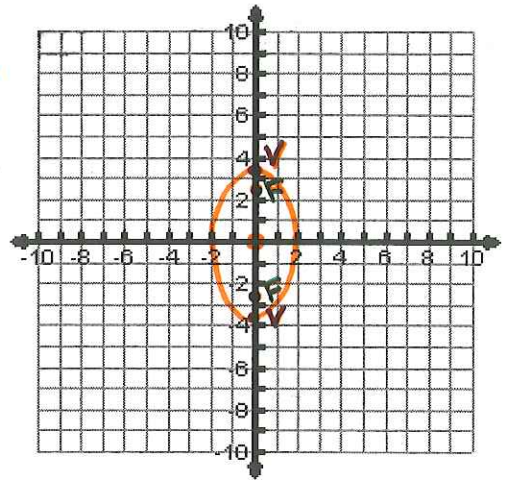
$$a^2 = b^2 + c^2$$

$$12 = 4 + c^2$$

$$8 = c^2$$

$$\sqrt{8} = c$$

$\sqrt{9} < \sqrt{8} < \sqrt{9}$   
 $2 < \sqrt{8} < 3$   
 ... 😊



9) Find the eccentricity of #8.

$$e = c/a$$

$$= \frac{\sqrt{8}}{\sqrt{12}}$$

$$= \frac{\sqrt{8/12}}$$

$$e = \sqrt{\frac{2}{3}}$$

10) Draw & label the graph of  $25(x-2)^2 - 16(y+3)^2 = 400$ .

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

$$c^2 = 16 + 25$$

$$c^2 = 41$$

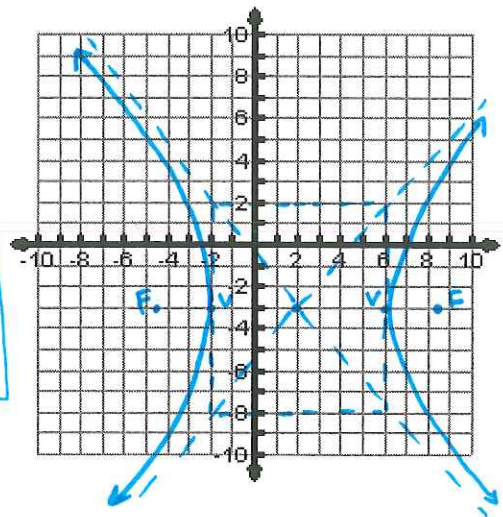
$$c = \sqrt{41}$$

$\sqrt{36} < \sqrt{41} < \sqrt{49}$   
 $6 < \sqrt{41} < 7$   
 ... 😊

$$\frac{25(x-2)^2}{400} - \frac{16(y+3)^2}{400} = \frac{400}{400}$$

$$\frac{(x-2)^2}{16} - \frac{(y+3)^2}{25} = 1$$

center:  $(2, -3)$   
 vertices:  $(-2, -3)$  and  $(6, -3)$   
 foci:  $(2 + \sqrt{41}, -3)$  and  $(2 - \sqrt{41}, -3)$   
 asymptotes:  $y = \pm \frac{5}{4}(x-2) - 3$



11) Find the eccentricity of #10.

$$e = c/a$$

$$e = \frac{\sqrt{41}}{4}$$

$$a^2 = 16$$

$$a = 4$$

12) Find the vertices & foci of  $4y^2 - 6x^2 = 36$ .

$$\frac{4y^2}{36} - \frac{6x^2}{36} = \frac{36}{36}$$

$$\frac{y^2}{9} - \frac{x^2}{6} = 1$$

$$a^2 = 9$$

$$a = 3$$

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

$$c^2 = 9 + 6$$

$$c^2 = 15$$

$$c = \sqrt{15}$$

center:  $(0,0)$

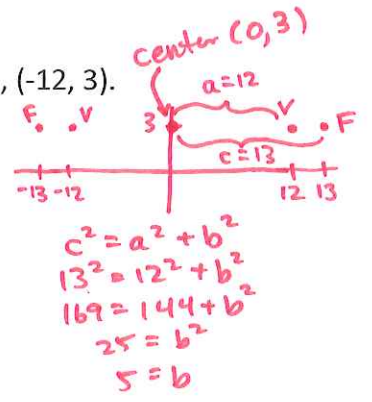
vertices:  $(0,3)$  and  $(0,-3)$   
 foci:  $(0, \sqrt{15})$  and  $(0, -\sqrt{15})$

13) Write the equation for a hyperbola with foci (13, 3), (-13, 3) & vertices (12, 3), (-12, 3).

$$\frac{x^2}{144} - \frac{(y-3)^2}{25} = 1$$

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

$$\frac{(x-0)^2}{12^2} - \frac{(y-3)^2}{5^2} = 1$$



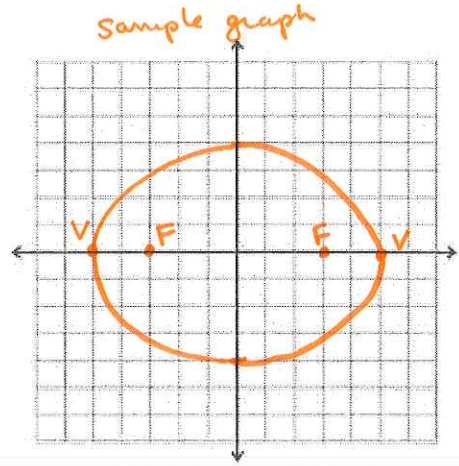
14) Find the equation of the asymptotes of #13.

$$y = \pm \frac{5}{12}(x-0) + 3$$

$$y = \pm \frac{5}{12}x + 3$$

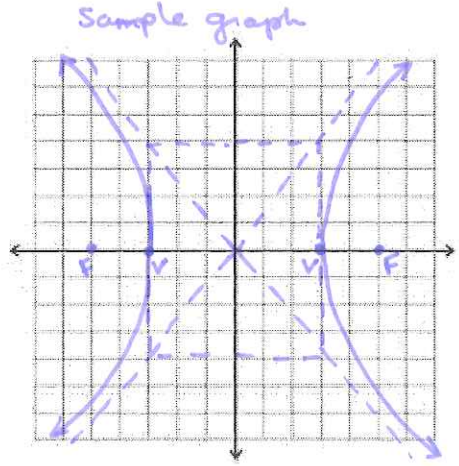
15) Draw and Label all parts of an ellipse.

answers vary



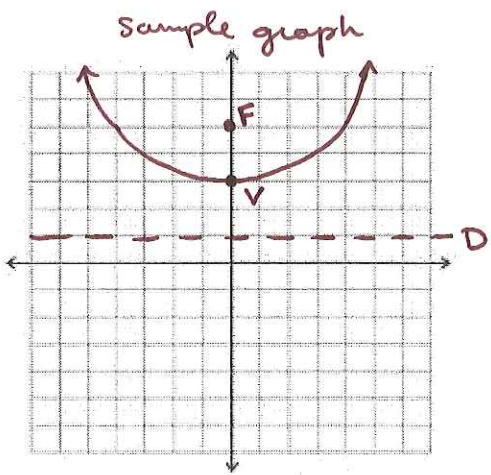
16) Draw and Label all parts of a hyperbola.

answers vary



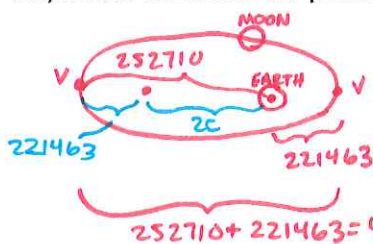
17) Draw and Label all parts of a parabola.

answers vary



focal width =  $|4p|$   
 $= 4(2)$   
 $= 8$

18) In the textbook do problem #53 on p. 653.



$$2a = 474173$$

$$a = 237086.5 \text{ miles}$$

$$2c = 474173 - (2 \cdot 221463)$$

$$2c = 31247$$

$$c = 15623.5 \text{ miles}$$

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

$$b = 236571.162 \text{ miles}$$

$$e = c/a$$

$$e = .066$$

19) In the textbook do problem #75 on p. 699.

$$18y = x^2$$

$$\text{vertex: } (0, 0)$$

$$4p = 18$$

$$p = 9/2$$

$$p = 4.5$$

$$\text{focus: } (0, 4.5)$$

20) In the textbook, do problem #53 on p. 641.

$$\text{vertex: } (0, 2)$$

$$\text{pt: } (-6, -4)$$

sub in vertex

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

$$(y-2)^2 = 4p(x-0)$$

$$(y-2)^2 = 4px$$

$$\rightarrow (y-2)^2 = 4(-3/2)x$$

$$(y-2)^2 = -6x$$

sub in pt to solve for p

$$(-4-2)^2 = 4p(-6)$$

$$(-6)^2 = -24p$$

$$36 = -24p$$

$$-3/2 = p$$

21) In the textbook, do problem #40 on p. 698.

Parabola

$$\text{vertex: } (1, -2)$$

opens left

$$\therefore p < 0$$

→

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

$$(y--2)^2 = 4p(x-1)$$

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

$$\text{focal length} = 2$$

$$\text{so, } p = -2$$

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

$$(y+2)^2 = -8(x-1)$$

22) Find the vertex, focus, directrix, and focal width of  $(x+2)^2 = -4(y-1)$ .

$$\text{vertex: } (-2, 1)$$

$$\text{focus: } (-2, 0)$$

$$\text{directrix: } y = 2$$

$$\text{focal width: } 4$$

$$-4 = 4p$$

$$-1 = p$$

