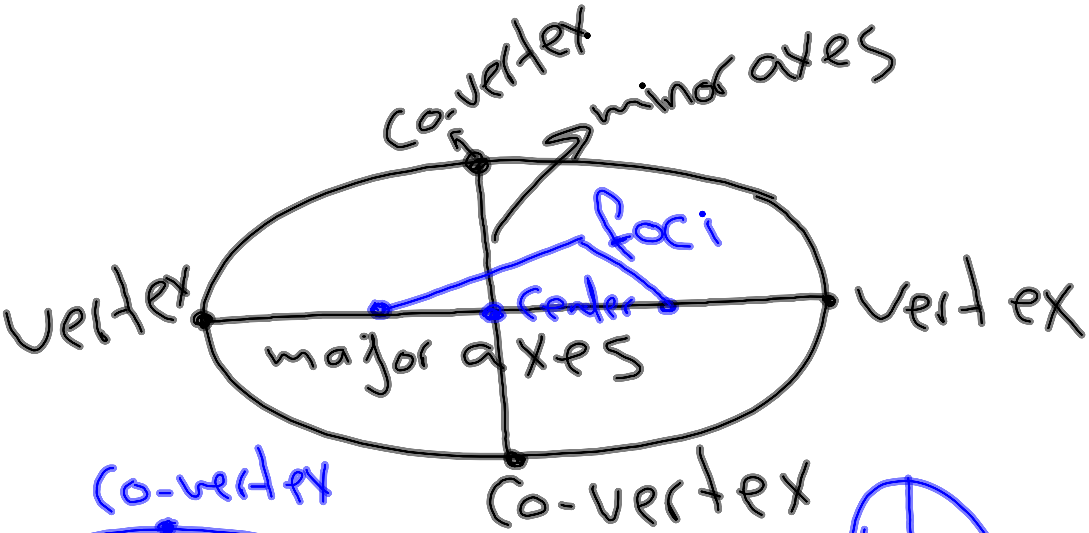
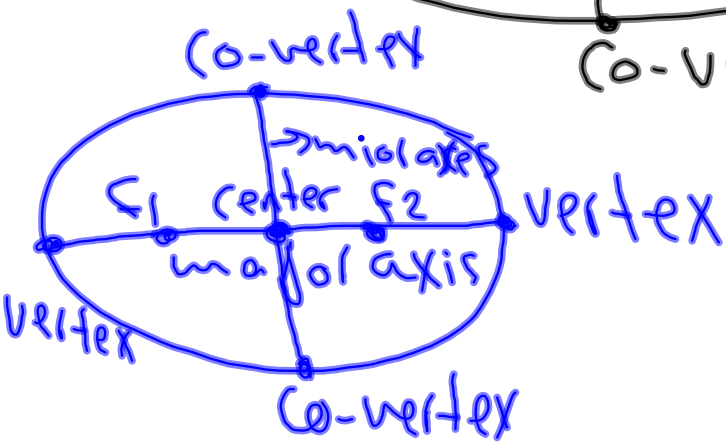
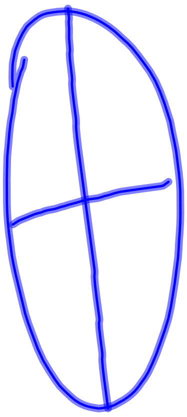
11.1 Ellipses Tues, 3/3/15

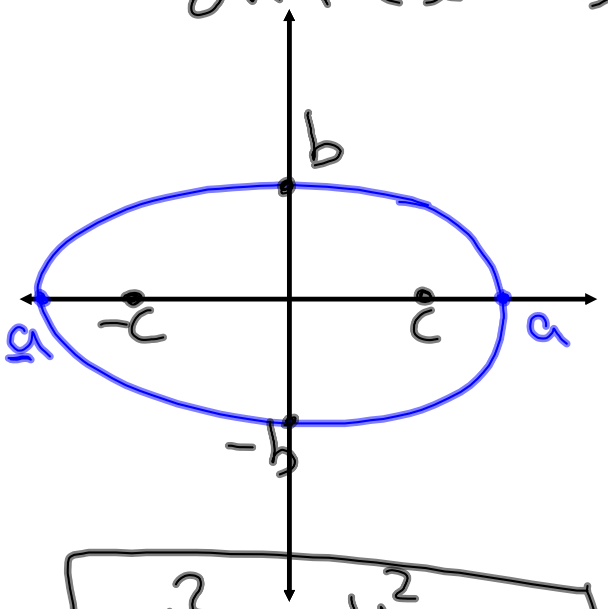
* An Ellipse. Is a set of Points in the Plane such that the distance from any Point to the two fixed Points (foci) is Constant.


co-vertex
minor axes
foci
vertex
center
vertex
major axes
co-vertex


co-vertex
f1
center
f2
vertex
major axis
vertex
co-vertex

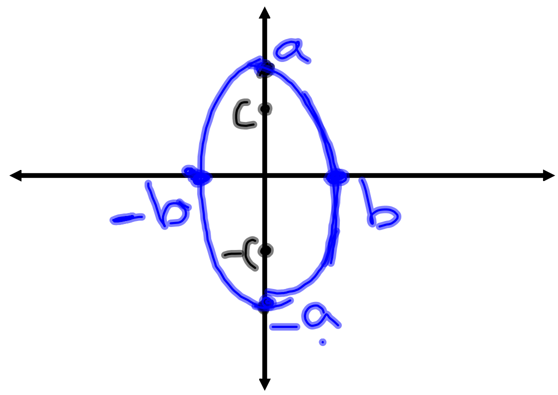


Major axis is on the x-axis



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

Major axis is on the y-axis



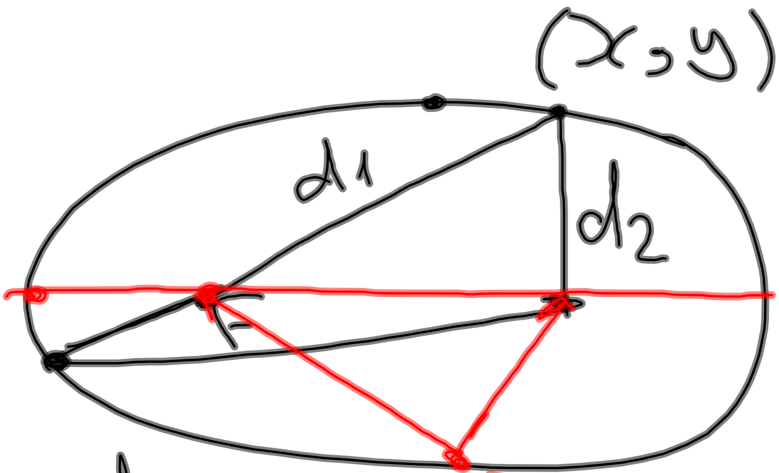
$$\boxed{\frac{x^2}{b^2}+\frac{y^2}{a^2}=1}$$

$$\boxed{c^2=a^2-b^2}$$

* The constant distance(k) = The length of the major axes

$$\boxed{k=2a}$$

$a>b>0$



$d_1 + d_2 = k$

Example 1 . P695

$$\frac{25x^2}{400} + \frac{16y^2}{400} = \frac{400}{400}$$

$$\boxed{\frac{x^2}{16_{b}} + \frac{y^2}{25_{a}} = 1} \qquad a > b$$

$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1 \Rightarrow \text{vertical.}$$

major axis lies on y-axis
minor axis 〃 〃 x-axis

$a^2 = 25$, $a = \pm 5$

vertices $= (0, 5), (0, -5)$

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

$$c = \sqrt{25 - 16} = \sqrt{9} = 3$$

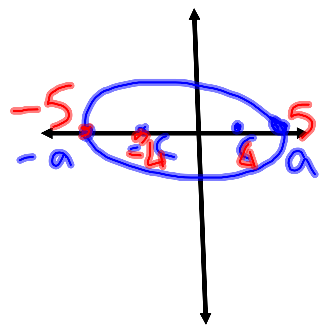
foci $= (0, 3), (0, -3)$

Exercise.

Show that the graph of $9x^2+25y^2=225$ is an ellipse. Label the foci, vertices, major axis, and minor axis.

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

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



Vertices $=(5,0),(-5,0)$

$c=\sqrt{a^2-b^2}=4$

foci $=(4,0),(-4,0)$

Major axis lies on x-axis

minor " " " y-axis

Example 2. P695

$$4x^2 + 9y^2 = 36 - 4x^2$$

$$\frac{\cancel{9}y^2}{\cancel{9}} = \frac{36-4x^2}{9}$$

$$y = \pm\sqrt{\frac{36-4x^2}{9}}$$

Example 3. P696

vertices $(0, \pm 6)$, foci $(0, \pm 2\sqrt{6})$

$$\frac{x^2}{12} + \frac{y^2}{36} = 1$$

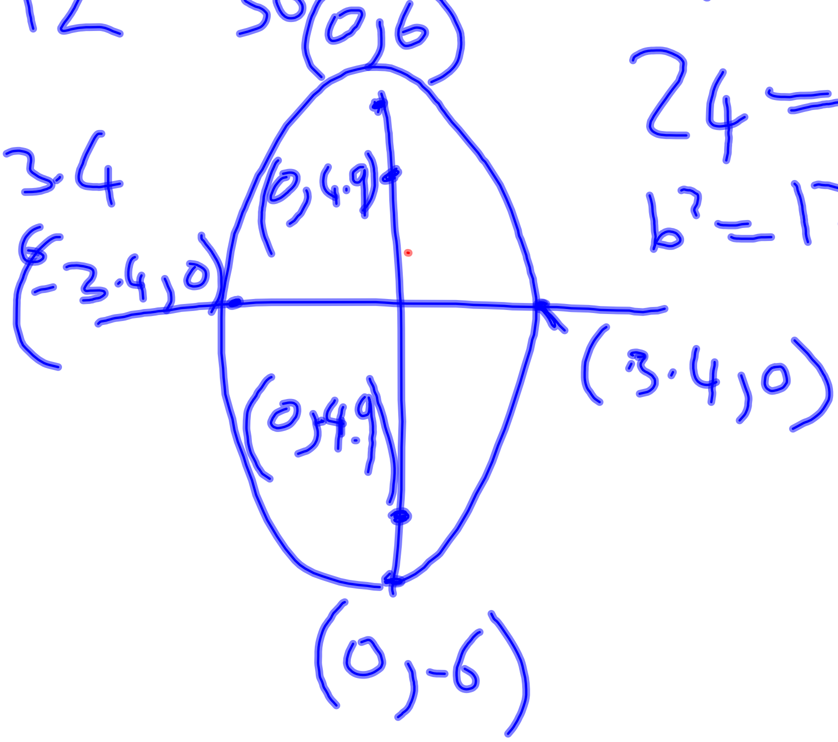
$$2\sqrt{6} = \sqrt{36 - b^2}$$

$$24 = 36 - b^2$$

$b^2 = 12 \quad b = 2\sqrt{3}$

$b = 3.4$

$a = 6$

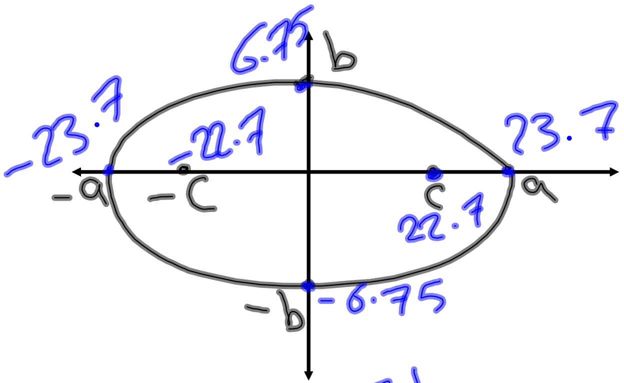


Example 4. P696

major axis = 47 ft, 4 in.

$= 47\frac{4}{12} = 47\frac{1}{3}$ ft

minor axis = 13.5



$a = \frac{k}{2} = \frac{47\frac{1}{3}}{2} = 23.7$

$b = \frac{13.5}{2} = 6.75$

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

$c = \sqrt{(23.7)^2 - (6.75)^2} = 22.7$

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

$\boxed{\frac{x^2}{561.7} + \frac{y^2}{45.6} = 1}$

Example 5. P697

min. distance from of a focus $= a - c$

max. " " " $= a + c$

$$a = \frac{299,190,000}{2} = 149,595,000$$

$$b = \frac{299,148,000}{2} = 149,574,000$$

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

$$c = \sqrt{a^2 - b^2} = 2,506,501$$

min. dist $= a - c =$

$149,595,000 - 2,506,501 =$

$147,088,000$ km

max dist $= a + c =$

$149,595,000 + 2,506,501 =$

$152,102,000$ km

Exercise(11-1) P698,699

7. $x^2+6y^2=18$ | $\frac{x^2}{18}+\frac{y^2}{3}=1$

8. $\frac{x^2}{4}+\frac{y^2}{25}=1$

9. $2x^2+y^2=12$

10. $\frac{x^2}{9}+\frac{y^2}{16}$

11. $\frac{x^2}{16}+\frac{y^2}{9}=1$

12. $\frac{x^2}{25}+\frac{y^2}{4}=1$

22) Area $= \pi ab$.

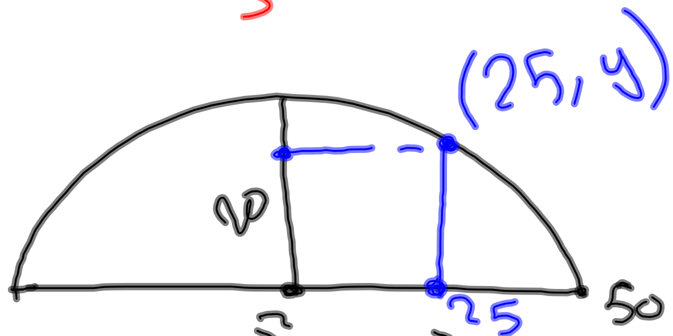
$$\frac{5x^2}{5} + \frac{y^2}{5} = \frac{5}{5}$$

$$\frac{x^2}{\underset{b^2 \leftarrow}{1}} + \frac{y^2}{\underset{a^2 \leftarrow}{5}} = 1$$

Area $= \pi ab = \pi \cdot 1 \cdot \sqrt{5} = \sqrt{5}\,\pi$

21) $\pi \cdot \sqrt{7} \sqrt{\frac{7}{3}} = 12.7$

$\boxed{30}$



$a = 50$
$b = 20$

$$\frac{(25)^2}{(50)^2} + \frac{y^2}{(20)^2} = 1$$

$$\frac{625}{2500} + \frac{y^2}{400} = 1$$

$$\frac{y^2}{400} = \frac{3}{4}$$

$$y^2 = \frac{3}{\cancel{4}} \times \cancel{400}$$

$$y^2 = 300$$

$$y = \sqrt{300} = 10\sqrt{3} = 17.3$$

H.w

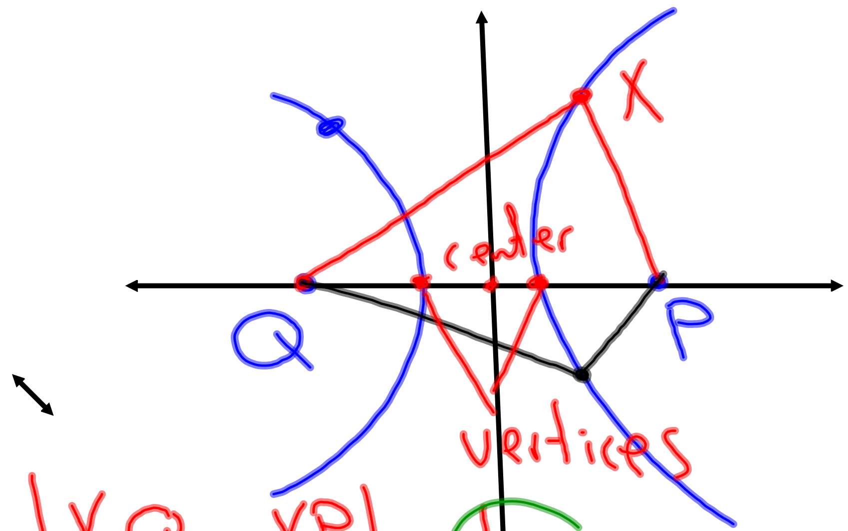
B.P 698, 699, 700 $\underline{\text{no}}$

2, 3, 5, 8, 23, 24, 28

11.2 Hyperbolas

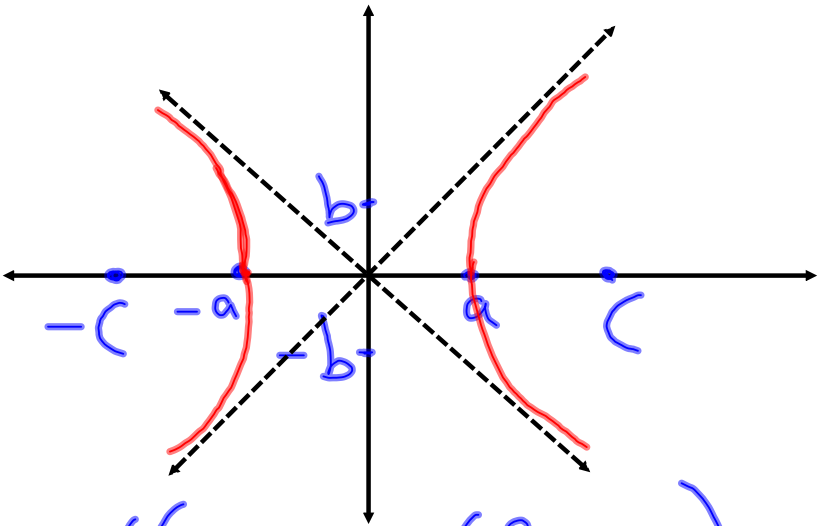
Mon, 16/3/15

* It is the set of all all Points x, such that the difference between the distances from every point x to the foci is constant.



$|XQ - XP| = K$ → constant no

Foci on x-axis



Foci $(c, 0)$, $(-c, 0)$

Vertecis = $(a, 0)$, $(-a, 0)$

Asymptotes $y = \frac{b}{a}x$, $y = \frac{-b}{a}x$

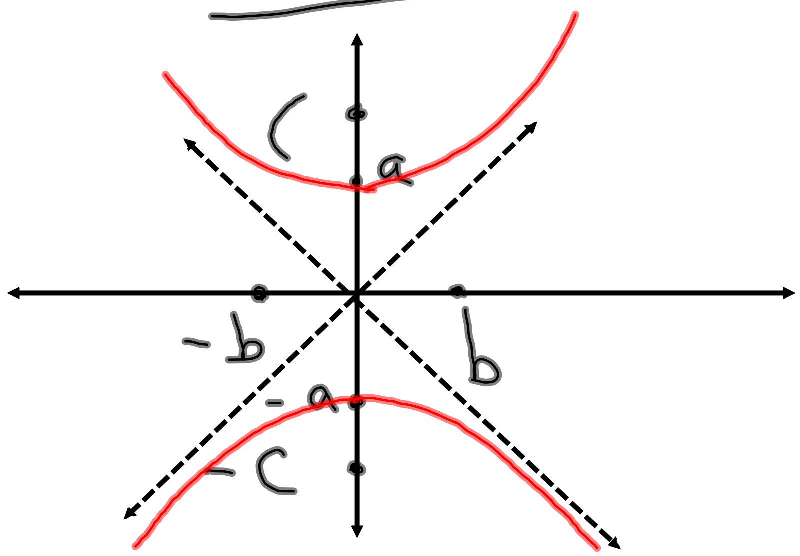
* Equation

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

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

$$\frac{k}{2} = a$$

Foci on y-axis



Foci $(0,c)$, $(0,-c)$

vertices $(0,a)$, $(0,-a)$

Asymptotes $y=\frac{a}{b}x$, $y=-\frac{a}{b}x$

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

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

$$a=\frac{k}{2}$$ → constant diff.

Example 1. P702

$$9x^2 - 4y^2 = 36$$

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

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

$$\underbrace{4}_{a^2} \qquad \underbrace{9}_{b^2}$$

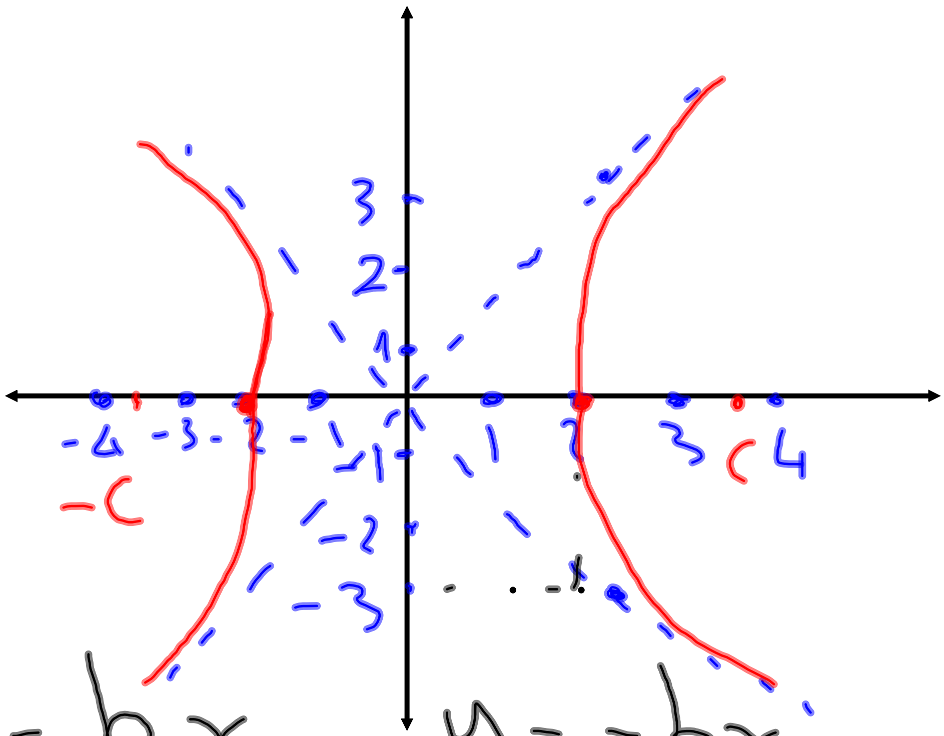
$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

vertices $(2,0), (-2,0)$

$$c = \sqrt{a^2+b^2} = \sqrt{13} = 3.6$$

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

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



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

$$y = \frac{3}{2}x \quad , \quad y = -\frac{3}{2}x$$

Example.

Show that the graph of $4y^2 - 16x^2 = 64$ is a hyperbola. Graph its asymptotes. Label the foci, and the vertices.

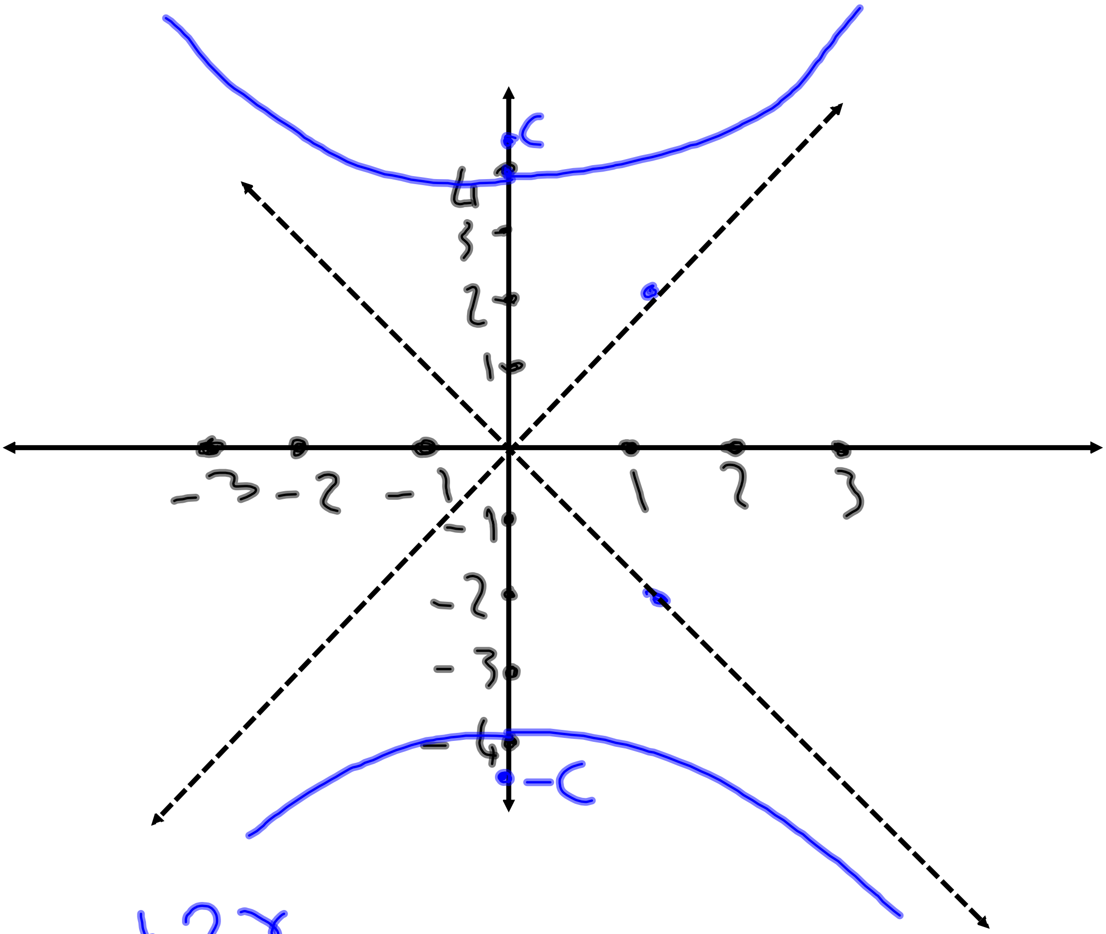
$$\frac{y^2}{16} - \frac{x^2}{4} = 1 \qquad \frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$

$$c = \sqrt{16+4} = \sqrt{20} \quad (0, 4.5)(0, -4.5)$$

Vert $= (0,4)(0,-4)$

Asym= $y = \pm 2x$

$$y = \pm \frac{a}{b}x \quad y = \frac{4}{2}x = 2x$$



$y = \pm 2x$

Example2. P 703

$$4x^2 - 9y^2 = 36$$

$$4x^2 - 36 = 9y^2$$

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

$$y = \sqrt{\frac{4x^2-36}{9}}, \quad y = -\sqrt{\frac{4x^2-36}{9}}$$

Exercise 11-2 . P 707

1 $\longrightarrow$ 6

3] vertex $(\overset{a}{2}, 0)$, $\longrightarrow$ $(\overset{x}{4}, \overset{y}{\sqrt{3}})$

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

$$\frac{4^2}{2^2} - \frac{(\sqrt{3})^2}{b^2} = 1$$

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

$$b = \pm 1$$

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

5) $c = (-3,0)$, $a = (-2,0)$

$a = 2$

$c = 3$

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

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

$$b = \sqrt{c^2 - a^2}$$
$$= \sqrt{9-4} = \sqrt{5}$$

4) $a = (0, \sqrt{12})$, $\longrightarrow (2\sqrt{3}, 6)$
$\phantom{4) a = (0, \sqrt{12}), \longrightarrow (} x \quad y$

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

$$\frac{36}{12} - \frac{12}{b^2} = 1$$

$$\frac{y^2}{12} - \frac{x^2}{6} = 1$$

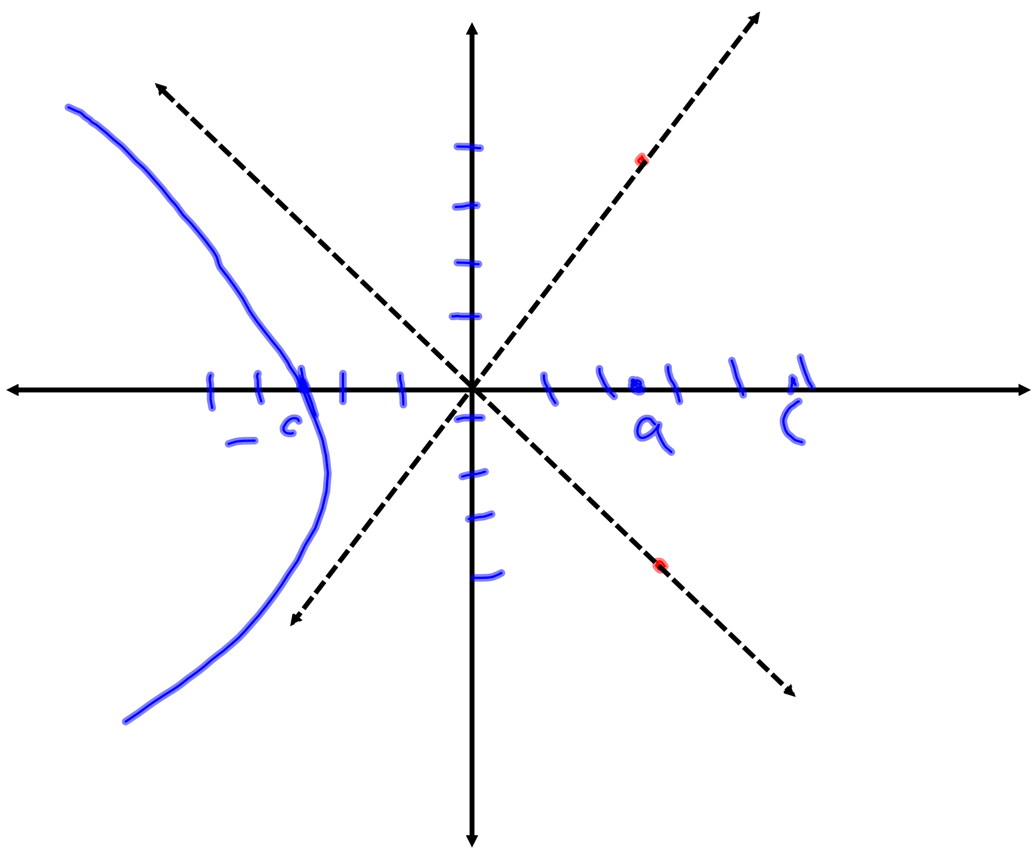
13) $\dfrac{x^2}{6} - \dfrac{y^2}{16} = 1$

$a = \sqrt{6} = 2.4$

$b = 4$

$c = \sqrt{6+16} = 4.7$

$y = \pm \dfrac{b}{a} x \quad y = \pm \dfrac{4}{\sqrt{6}} x = \pm \dfrac{4}{2.4} x$



Correction of HW P700

$\boxed{28}$ min dist = $a - c$

max dist = $a + c$

major axes = $2a$ = 1,636,484,848

$a = 818242424$

$a - c = 54004000$

$c = 764238424$

Maxdist $a + c = 1582480848$

$\boxed{24}$ $a = 750, b = 640$

$$\pi \left(3a + 3b\right) - \sqrt{(a+3b)(b+3a)}$$

$$\pi \left(3 \cdot 750 + 3 \cdot 640\right) - \sqrt{(7 \quad - \quad - \quad -}$$

$$\boxed{10{,}323.62}$$

Exercise. P707.

17) $18y^2 - 8x^2 - 2 = 0$

$$\frac{18y^2}{2} - \frac{8x^2}{2} = \frac{2}{2}$$

$$9y^2 - 4x^2 = 1 \qquad \frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$

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

$$a = \pm\frac{1}{3}, \quad b = \pm\frac{1}{2}$$

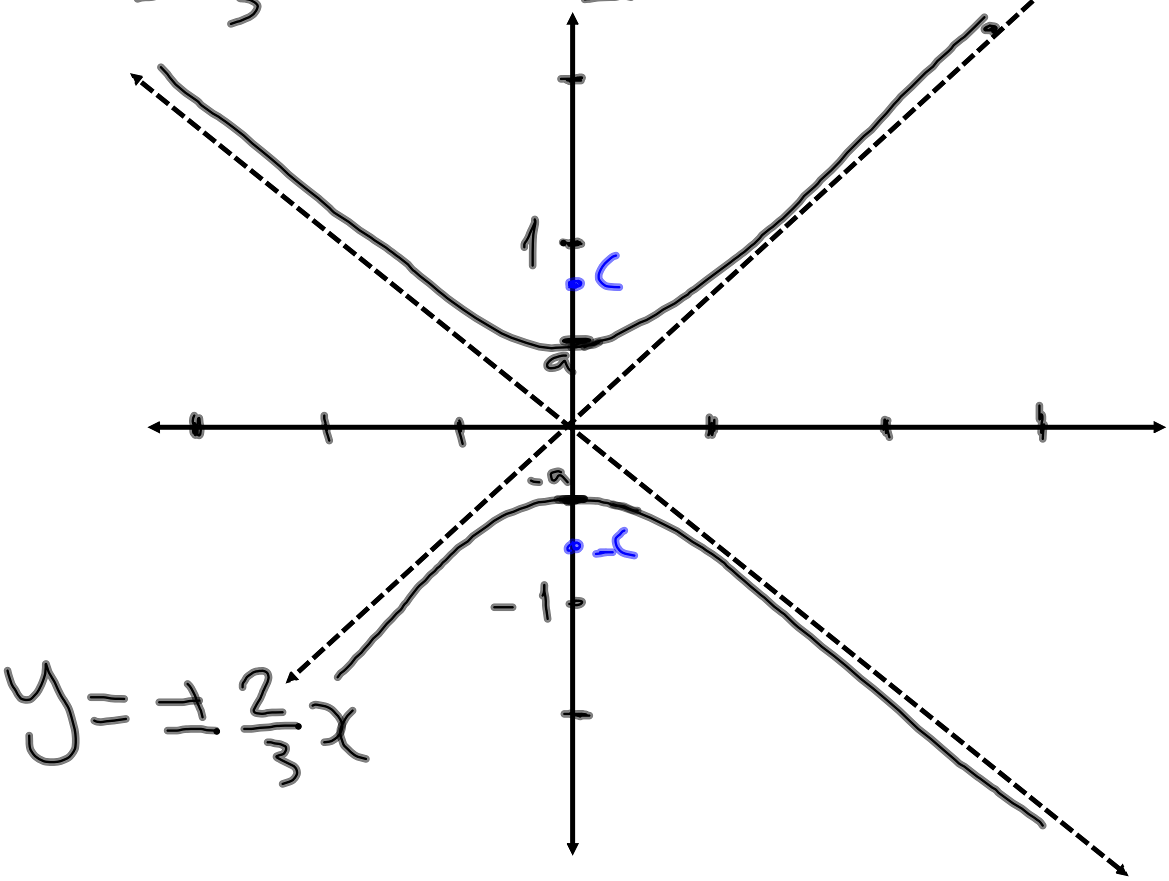
$$y = \pm\frac{a}{b}x \qquad \frac{1}{3} \times \frac{2}{1} = \frac{2}{3}$$

$$y = \pm\frac{\frac{1}{3}}{\frac{1}{2}}$$

$$\boxed{y = \pm\frac{2}{3}x}$$

$$c = \sqrt{a^2 + b^2} = \frac{\sqrt{13}}{6} = 0.6$$

$a = \pm \frac{1}{3}$, $b = \pm \frac{1}{2}$, $c = \pm 0.6$

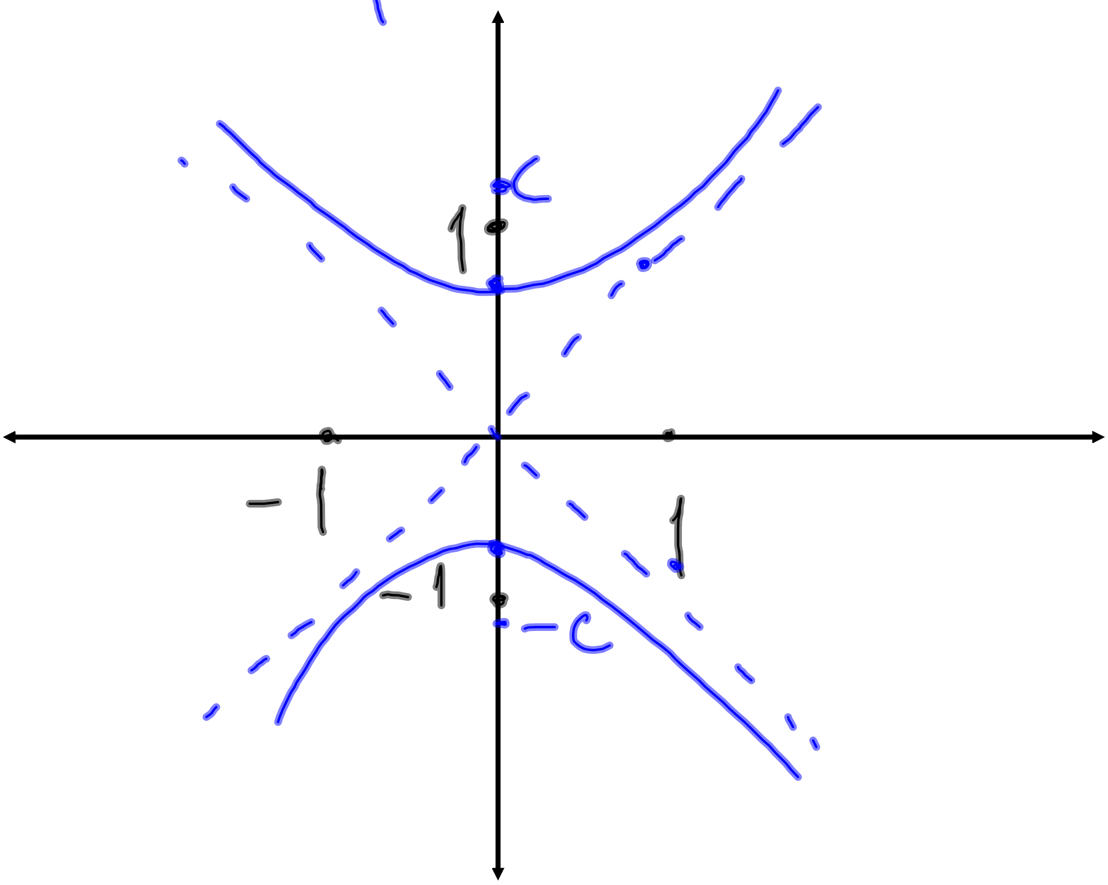


18] $a = \pm \frac{\sqrt{2}}{2} = \pm 0.7$

$b = \pm 1$

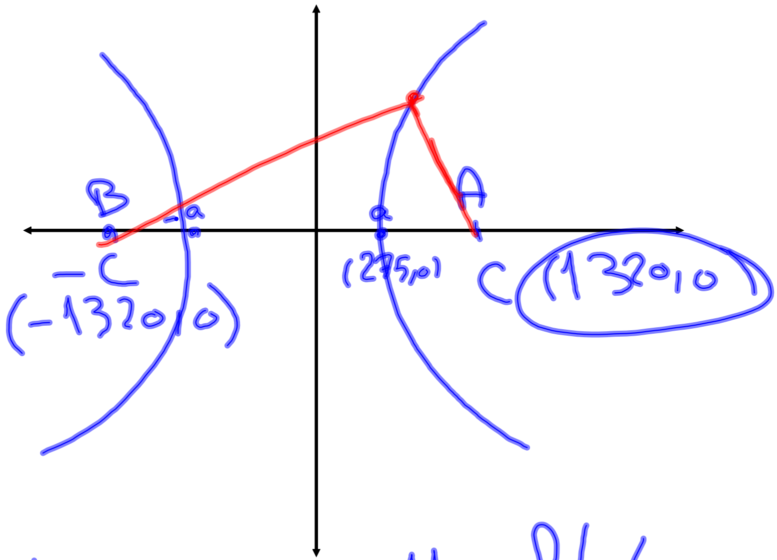
$c = \pm \frac{\sqrt{6}}{2} = \pm 1.2$

$y = \pm \frac{0.7}{1} x$



Example 4. P705.

$\frac{1}{2} \times 5280 = \boxed{2640 \text{ ft.}}$ $\quad 1 \text{ mi} = 5280 \text{ ft}$



$\frac{1}{2}$ sec, $S = 1100$ ft/sec.

$d = St = 1100 \times \frac{1}{2} = 550$ ft

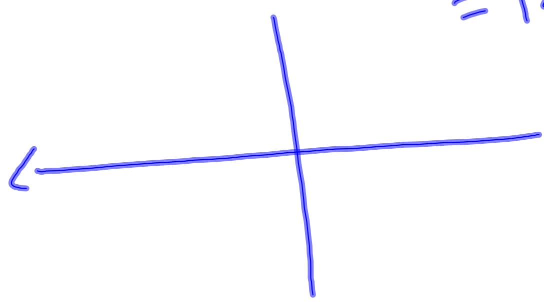
* Ship A is 550 ft closer to the explosion than Ship B

$k = 550$

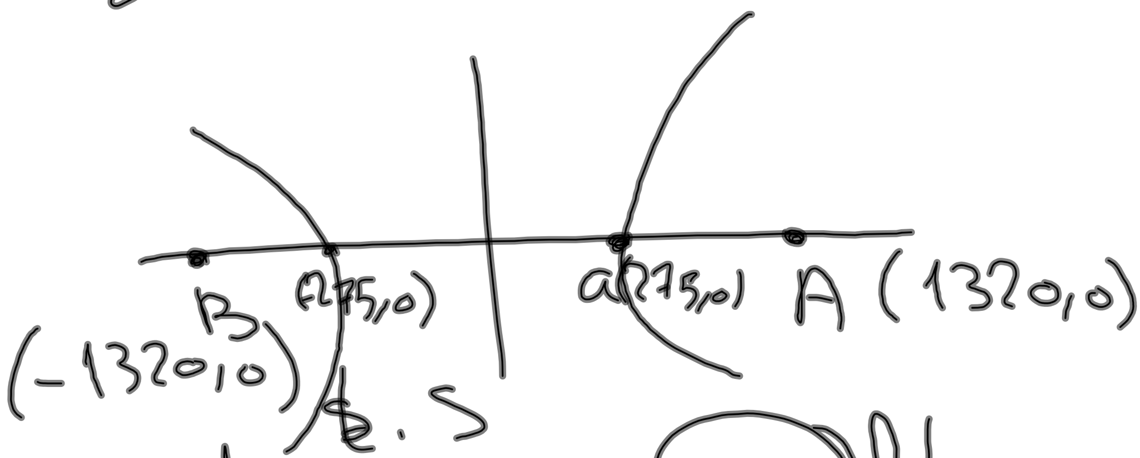
$a = \frac{k}{2} = \frac{550}{2} = 275$ ft

$b = \sqrt{c^2 - a^2} = \sqrt{1320^2 - 275^2}$

$= 1291$ ft.



$$\frac{1}{2} \times 5280 = 2640$$



$$d = \frac{1}{2} \cdot 1100 = 550 \text{ ft}$$

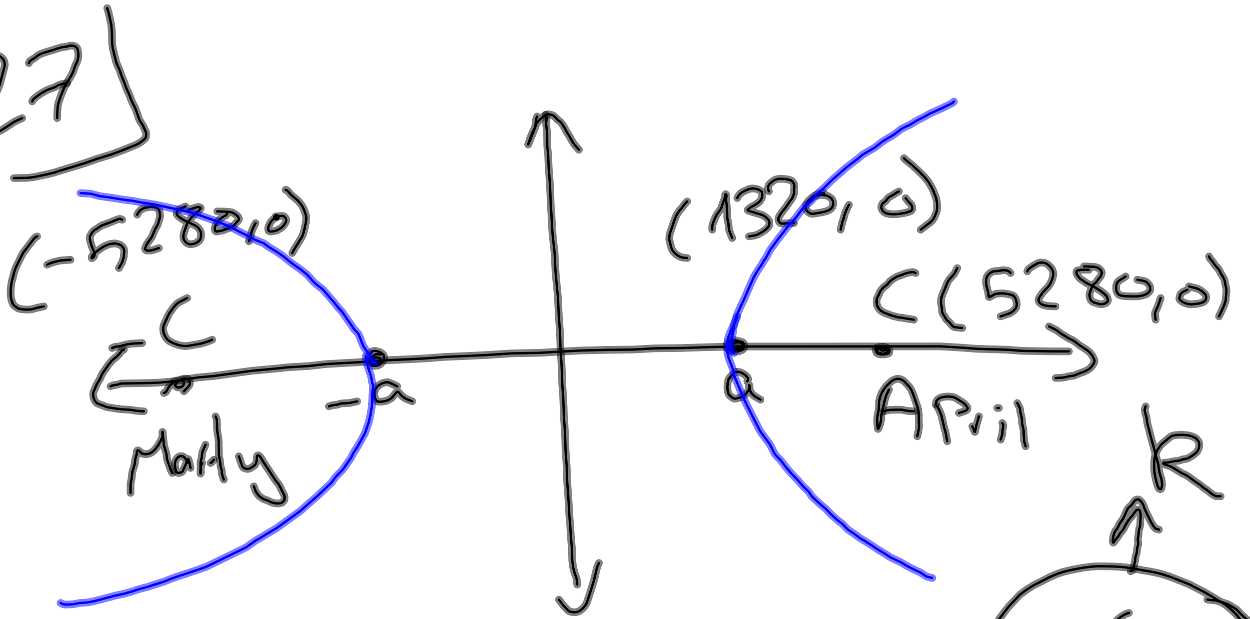
$$a = \frac{k}{2} = \frac{550}{2} = 275 \text{ ft}$$

The explosion will be any point on the branch which is closer to ship A

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

$$\boxed{\frac{x^2}{275^2} - \frac{y^2}{1291^2} = 1}$$

27)



$$d = st = 1100 \times 2.4 = 2640$$

$$a = \frac{k}{2} = \frac{2640}{2} = 1320$$

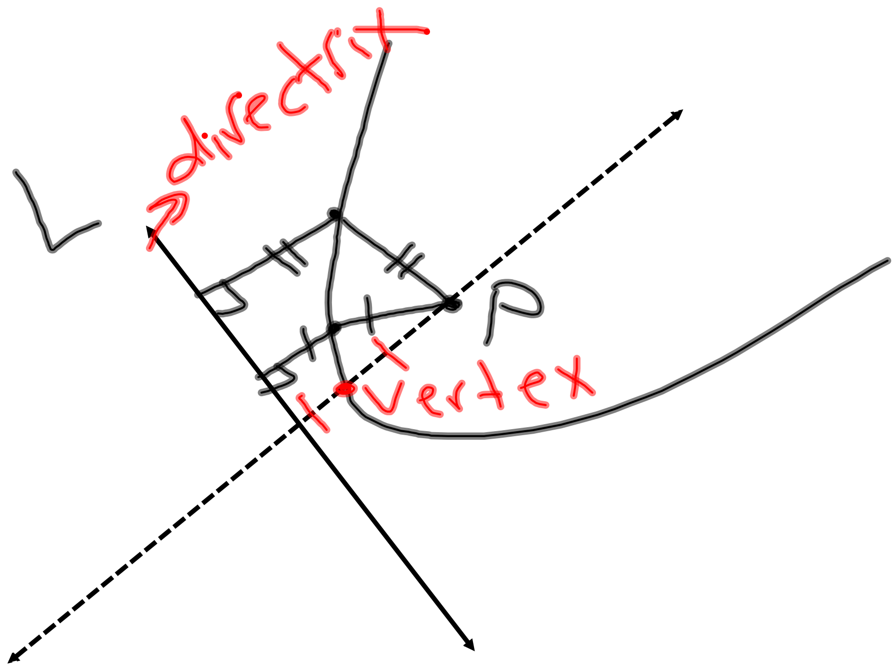
* The sound will be any point on the branch which is closer to marty

$$b = \sqrt{5280^2 - 1320^2} = 5112.3$$

$$\frac{x^2}{1320^2} - \frac{y^2}{5112.3^2} = 1$$

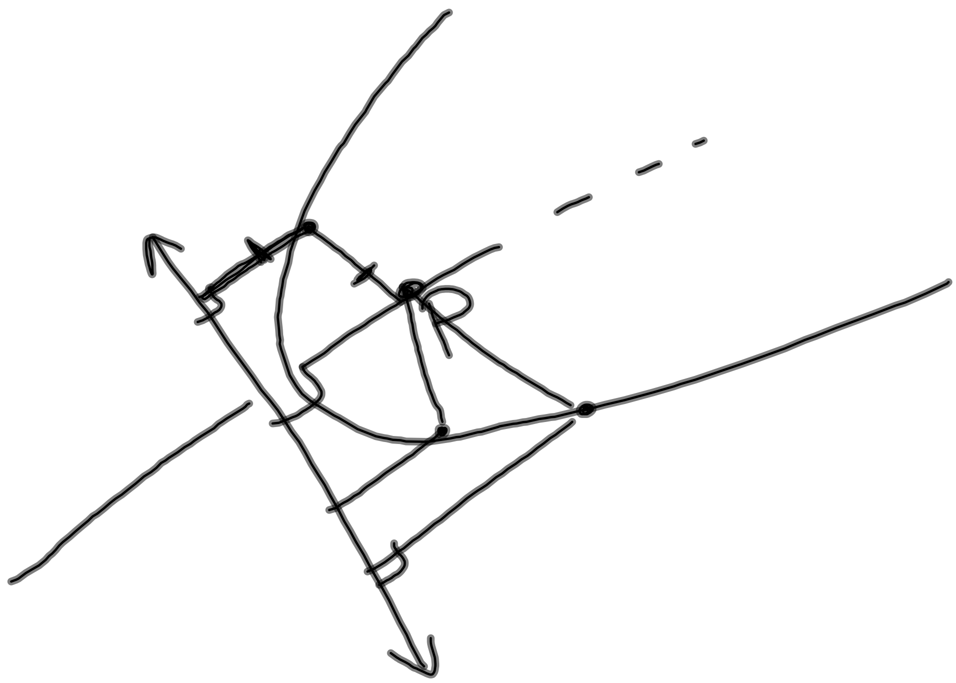
Mon, 23/3/15

11-3 Parabolas



* A Parabola.

Let L is a st. line and P is a Point that lies on the axis of L. Then the set of all Points which are equidistant from L and P lies on a Parabola with focus P



Equation of Parabola

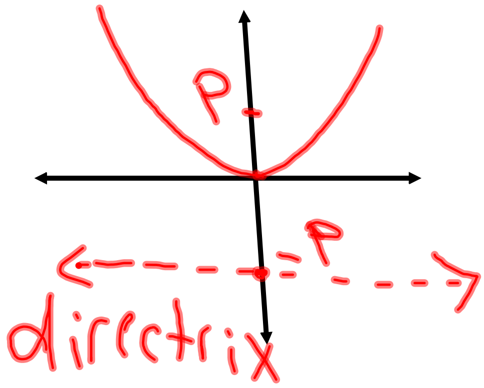
Opens towards y-axis

$x^2 = 4Py$ or $y = \frac{1}{4P}x^2$

focus $(0, P)$

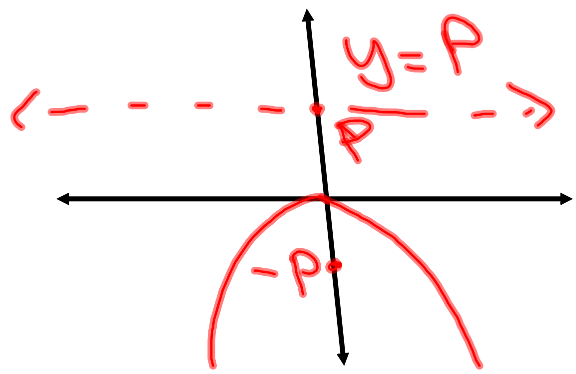
directrix $y = -P$

axis of Symmetry is y-axis

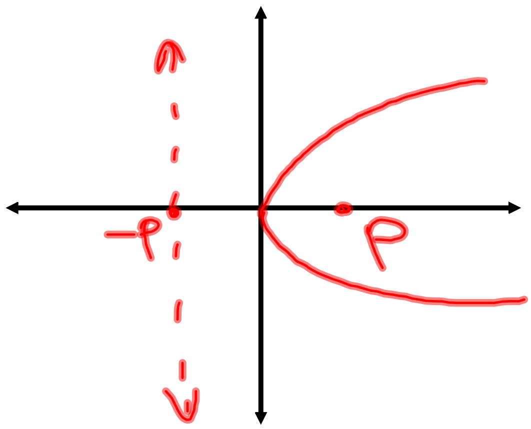


If $P > 0$ it opens upward

* If $P < 0$, it opens downwards



Opens towards x-axis



$y^2 = 4px$

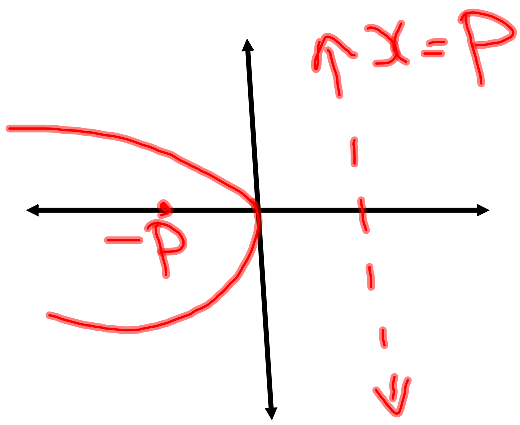
focus $(p, 0)$

directrix $x = -p$

axis of symmetry $\rightarrow$ x-axis

If $p > 0$ it opens to the right

If $p < 0$ it opens to the left



Example 1. P711

$x^2 + 8y = 0$

$x^2 = -8y$

$x^2 = 4Py$

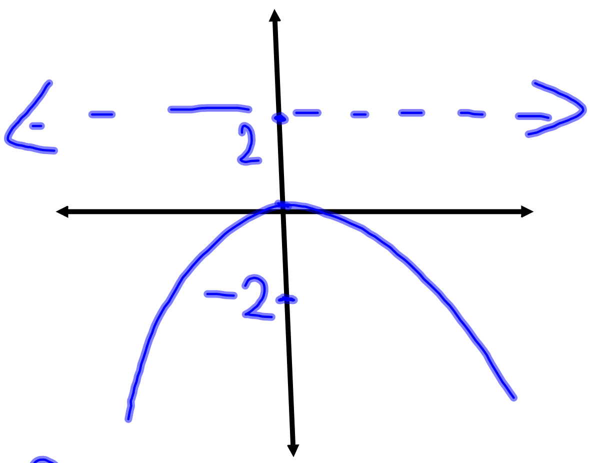
$P = -2$

$\cancel{x^2} = -8\cancel{y}$

$\cancel{x^2} = 4P\cancel{y}$

$\frac{4P}{4} = \frac{-8}{4}$

$P = -2$



focus $(0, -2)$

directrix $y = 2$

$x^2 = 4Py$

$\boxed{x^2 = -8y}$

Exercise

Show that the graph of $y^2 - 16x = 0$ is a parabola. Draw the graph then find and label its focus and directrix

Example 3. P 712

Point $(\underset{x}{-1}, \underset{y}{\sqrt{12}})$

$y^2 = 4Px$

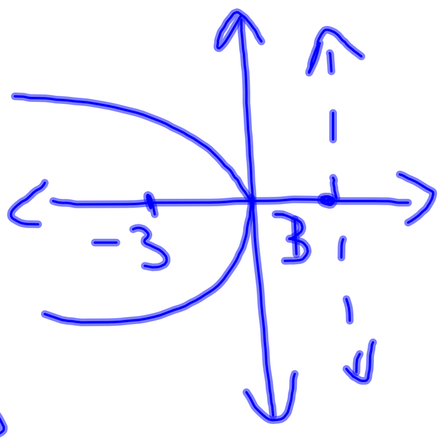
$12 = 4 \cdot P \cdot -1$

$12 = -4P$

$P = -3$

$y^2 = 4(-3)x$

$\boxed{y^2 = -12x}$



focus $(-3, 0)$

direcrtrix $x = 3$

Exercise.

Find the equation, the focus and directrix of a Parabola that Passes through $(\sqrt{20}, 5)$ with vertex $(0,0)$, and focus on the y-axis, then graph the Parabola.

11-3 Parabolas

Tues, 24/3/15

Exercise 11.3 P714

y-axis $\qquad$ $x \quad y$

1) axis $\rightarrow$ $\underline{x=0}$, $(2,12)$

opens towards y-axis

$$\underline{x}^2 = 4py$$

$$4 = 4p \cdot 12$$

$$\frac{4}{48} = \frac{48p}{48}$$

$$p = \frac{1}{12}$$

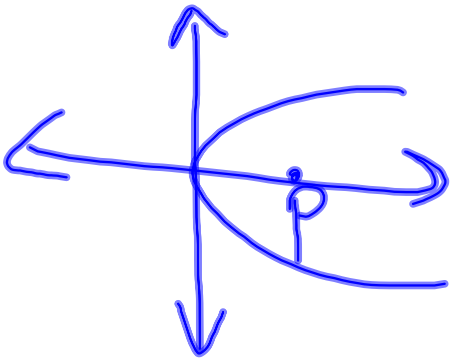
$$x^2 = {}^{1}\cancel{4}\left(\frac{1}{\cancel{12}_{3}}\right)y \qquad x^2 = 4\cancel{p}y$$

$$x^2 = \frac{y}{3} \text{ or } \frac{1}{3}y$$

3] focus $(5,0)$

$y^2 = 4px$

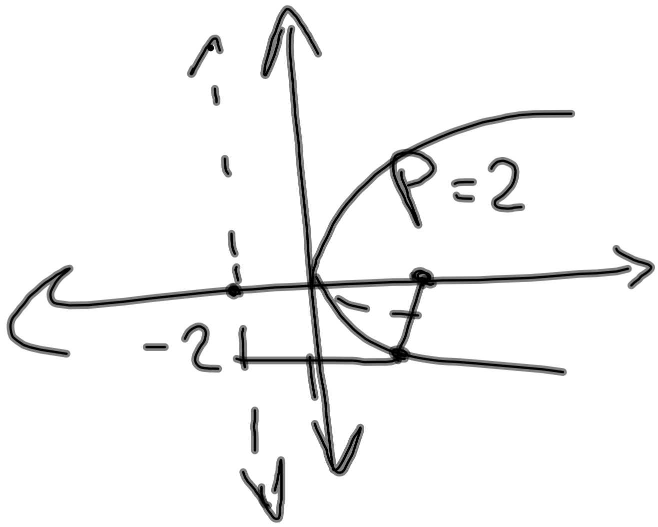
$\boxed{y^2 = 20x}$



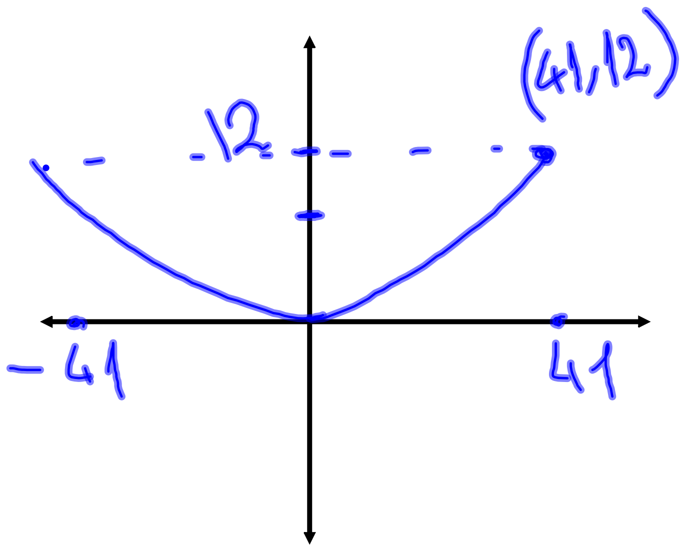
5) directrix $= x = -2$,

$y^2 = 4Px$

$\boxed{y^2 = 8x}$



Example 4. P713



$$x^2 = 4Py$$

$$41^2 = 4 \cdot P \cdot 12$$

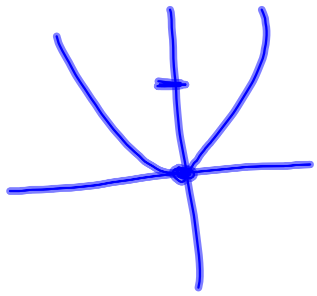
$$\frac{1681}{48} = \frac{48}{48} P$$

$$\boxed{P = 35}$$

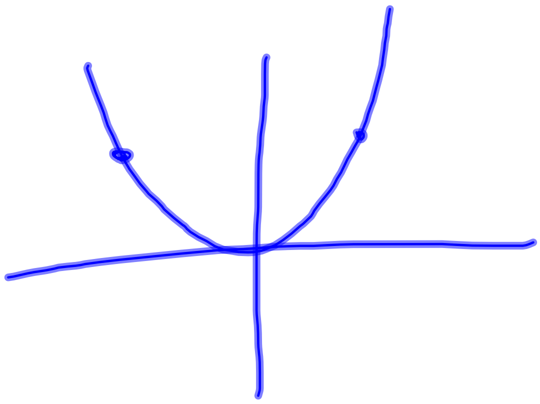
25

27

11, 12, 15, 16



$\boxed{9}$



H.W

P 715 № 13, 14, 17, 18, 20, 21, 22, 23, 24, 26, 28

Mon, 30/3/15

11.4 Translations and Rotations of Conics

Example 1. P716

$$\frac{(x-5)^2}{9} + \frac{(y+4)^2}{36} = 1$$

$(x-h)^2$ $(y-k)^2$

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

$36 \to a^2$

h k

Center $(5, -4)$

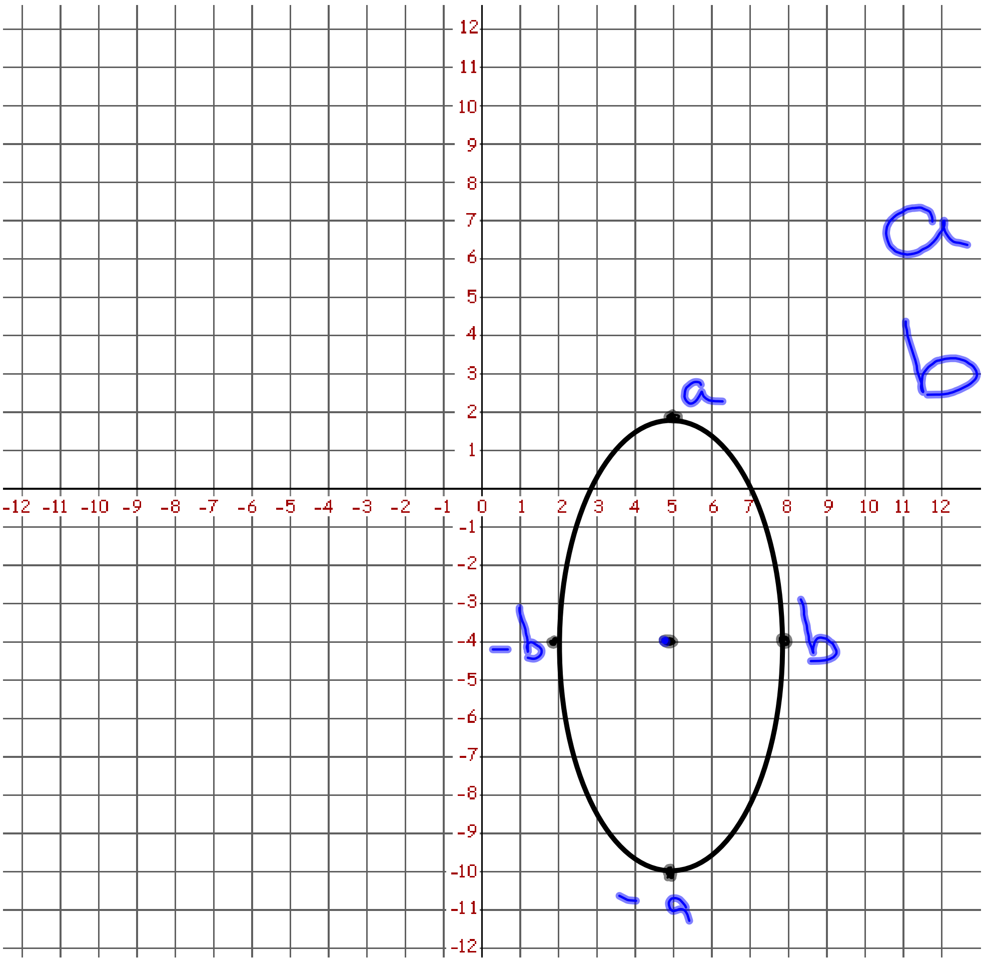
$a = \pm 6$, $b = \pm 3$

Vertices $(h, k \pm a)$

$(5, 2), (5, -10)$

Co-vertices $(h \pm b, k)$

$(8, -4), (2, -4)$

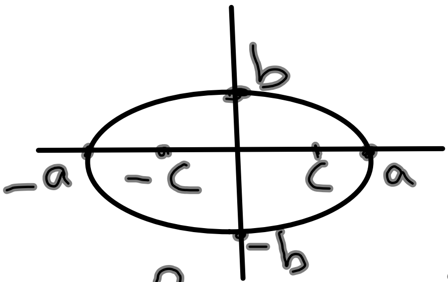


a = 6

b = 3

Ellipse with center (h,k)

major axis → x-axis



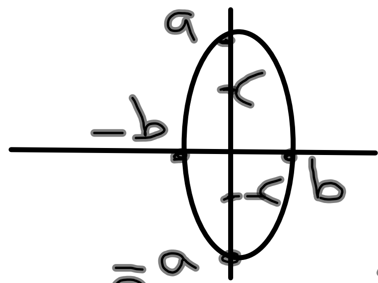
$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

vertices $(h\pm a, k)$

co-vertices $(h, k\pm b)$

foci $(h\pm c, k)$

major axis y-axis



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

vertices $(h, k\pm a)$

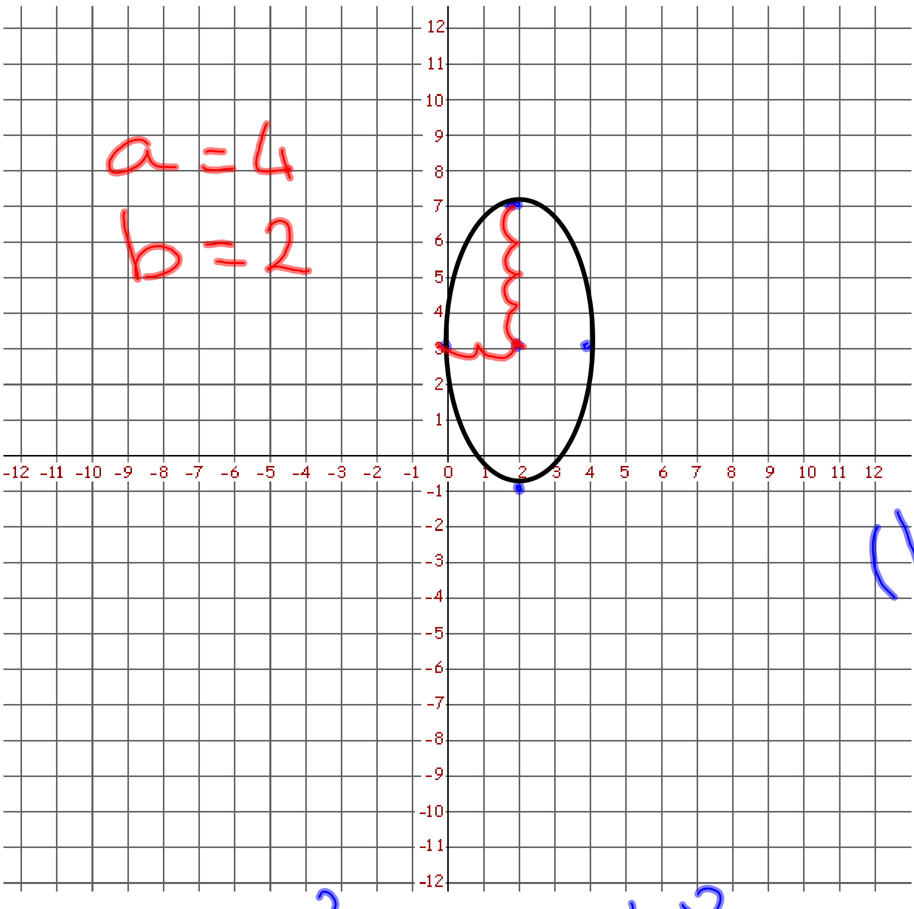
co-vertices $(h\pm b, k)$

foci $(h, k\pm c)$

Exercise 11-4. P 726

1] Center $(\overset{h}{2},\overset{k}{3})$

$(2,-1),(0,3),(2,7),(4,3)$



$(h, k\pm a) = 2,7$

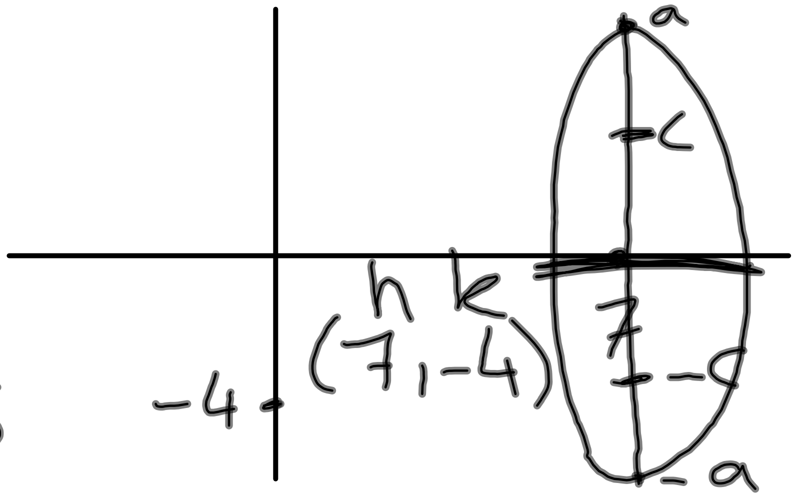
$$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$$

$$\frac{(x-2)^2}{4}+\frac{(y-3)^2}{16}=1$$

3)

$a = 6$

$b = 2.5$



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

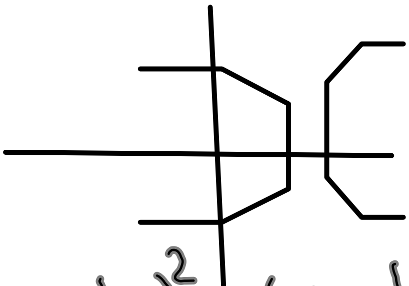
$$\frac{(x-7)^2}{6.25} + \frac{(y+4)^2}{36} = 1$$

or

$$\frac{4(x-7)^2}{25} + \frac{(y+4)^2}{36} = 1 \qquad 6.25 = \frac{25}{4}$$

Hyperbola with Center (h,k)

Opens $\rightarrow$ x-axis

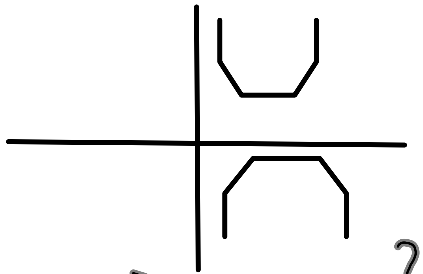


$$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$$

vertices $(h\pm a, k)$

foci $(h\pm c, k)$

Opens $\rightarrow$ y-axis



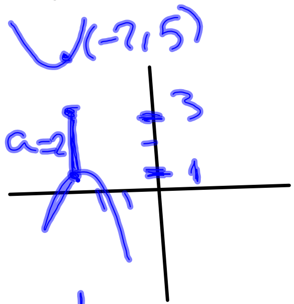
$$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$$

$(h, k\pm a)$

$(h, k\pm c)$

P726

5) Center $(\overset{h}{-2},\overset{k}{3})$, vertex $(-2,1)$,
Passing through $(\overset{x}{-2+3\sqrt{10}},\overset{y}{11})$



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

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

$$\frac{(11-3)^2}{4}-\frac{(\cancel{-2}+3\sqrt{10}+\cancel{2})^2}{\cancel{b^2}\ 6}=1$$

$$16-\frac{90}{b^2}=1$$

$$16-1=\frac{90}{b^2}$$

$$15=\frac{90}{b^2}$$

$$b^2=6$$

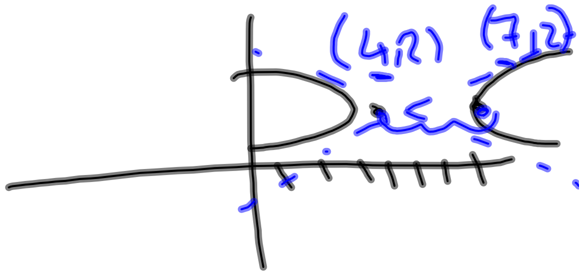
$$\frac{(y-3)^2}{4}-\frac{(x+2)^2}{6}=1$$

7) Center $(4,2)$, vertex $(7,2)$

$3y = 4x - 10$

$a = 3$

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



$\frac{\cancel{3}}{\cancel{3}} y = \frac{4x}{3} - \frac{10}{3}$

$y = \frac{4}{3} x - \cancel{\frac{10}{3}}$

$\frac{b}{a}$

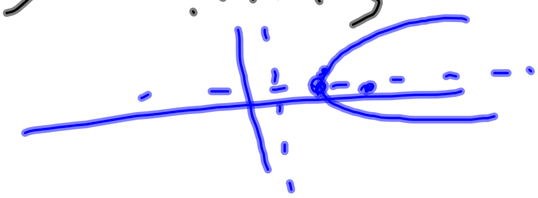
$\boxed{b = 4}$

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

$$\frac{(x-4)^2}{9^2} - \frac{(y-2)^2}{16} = 1$$

Parabola with center (h,k)

x-axis



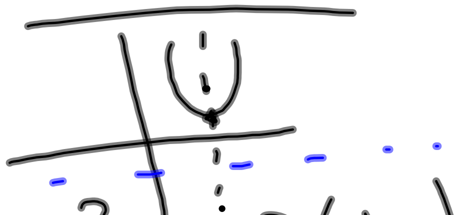
$$(y-k)^2 = 4p(x-h)$$

focus $(h+p, k)$

axis $y = k$

directrix $x = h-p$

y-axis



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

$(h, k+p)$

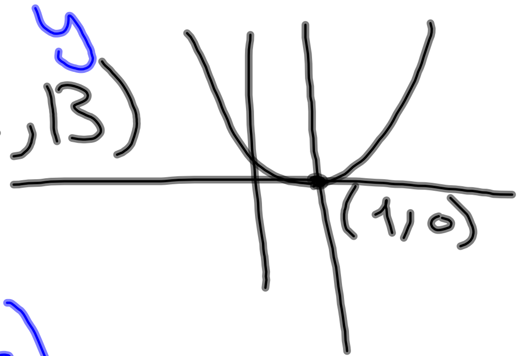
axis $x = h$

$y = k-p$

P. 726

9] vertex $(\overset{h}{1}, \overset{k}{0})$, axis $x=1$

Passing through $(\overset{x}{2}, \overset{y}{13})$



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

$$(2-1)^2 = 4P(13)$$

$$\frac{1}{52} = \frac{\cancel{52}P}{\cancel{52}}$$

$$\boxed{P = \frac{1}{52}}$$

$$(x-1)^2 = \cancel{4} \cdot \frac{1}{\cancel{52}_{13}} \cdot (y)$$

$$(x-1)^2 = \frac{1}{13}y$$

$\underline{11}$ vertex $(2,1)$, axis $y=1$

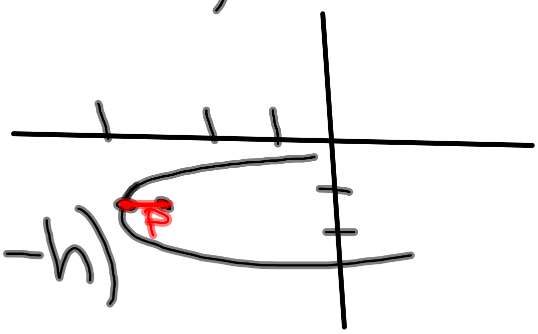
Passing through $(5,0)$

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

15) Parabola with vertex $(-3,-2)$, focus $\left(-\frac{47}{16}, -2\right)$

-2.9

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



$$P = \left|-3 - \frac{-47}{16}\right| = \frac{1}{16}$$

$$(y+2)^2 = \cancel{4} \cdot \frac{1}{\cancel{16}\,4}(x+3)$$

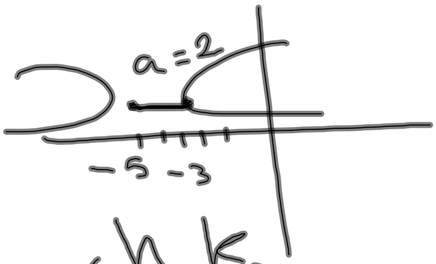
$$\boxed{(y+2)^2 = \frac{1}{4}(x+3)}$$

H.w

P726 no 2,4,6,8,10,12

Correction of H.w

6)



$\left(\overset{x}{-1}, \overset{y}{1-4\sqrt{3}}\right)$ $\left(\overset{h}{-5}, \overset{k}{1}\right)$

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

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

$$4-\frac{48}{b^2}=1$$

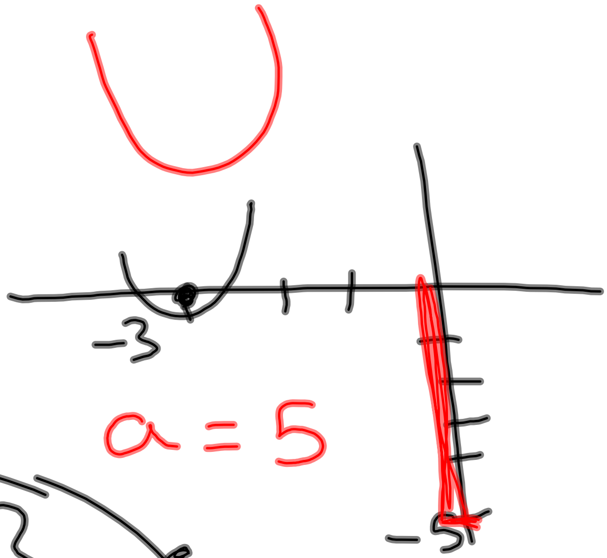
$$4-1=\frac{48}{b^2}$$

$$\frac{3}{1}=\frac{48}{b^2}$$

$$b^2=16$$

$$\frac{(x+5)^2}{4}-\frac{(y-1)^2}{16}=1$$

8)



$$\frac{(y+5)^2}{25} - \frac{(x+3)^2}{\cancel{b^2}\,36} = 1$$

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

$$\frac{6y}{6} = \frac{5x}{6} - \frac{15}{6}$$

$$y = \frac{5}{6}x$$

Tues, 31/3/15

11.4 Translations and Rotations of Conics

The Discriminant

$b^2 - 4ac$

Second degree equation

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

$B^2 - 4AC < 0 \Rightarrow$ circle or ellipse

$B^2 - 4ac = 0 \Rightarrow$ Parabola or 2 // lines

$B^2 - 4ac > 0 \Rightarrow$ HyPerbola or 2 intersecting lines

Example 8. P723

$$\overset{A}{2}x^2 - \overset{B}{4}xy + \overset{C}{3}y^2 + 5x + 6y - 8 = 0$$

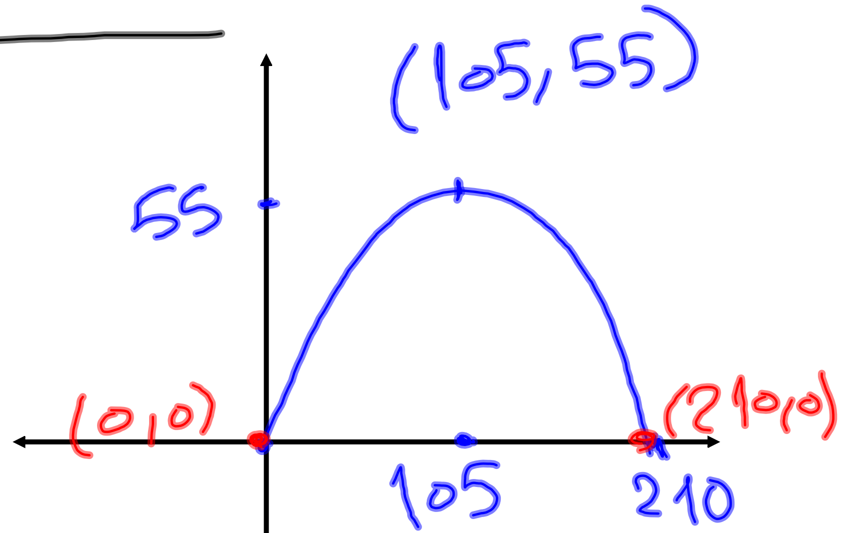
$$B^2 - 4ac$$

$$(-4)^2 - 4 \cdot 2 \cdot 3 = \boxed{-8}$$

The graph is an ellipse.

Exercise 11.4 P726

17 → 22



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

$$(x-105)^2 = 4P(y-55)$$

$$(0-105)^2 = 4P(0-55)$$

$$P = -50.11$$

$$(x-105)^2 = 4\cdot -50.11(y-55)$$

$$(x-105)^2 = -200.5(y-55)$$