Algebra 2 Tuesday 2-19-13 Class Notes

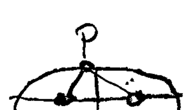
Ch. 12-3 Ellipses

- Very closely related to a circle, a circle can be thought of as a special case of a ellipse.
- Circle has one "focal point" so it is called the center. An ellipse has two focal points and a center.

  Note: most books call this the midpoint of the ellipse but we will use center to match your book.

- Geometry:

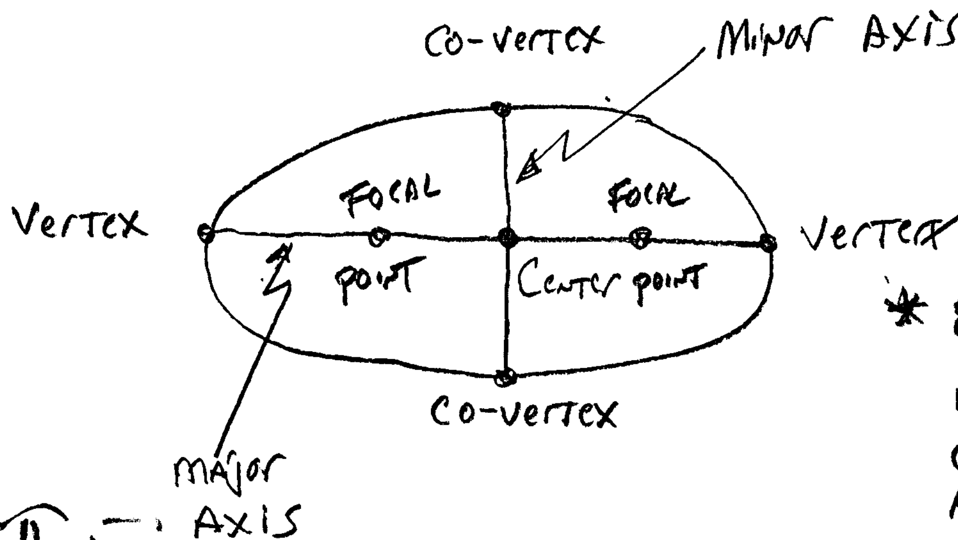
circle is the locus (location) of all points equidistant from its focal point

Right-Left 

Up-Down 

Ellipse is the locus of all points such that the sum of the distances to the 2 focal points is constant

Naming the parts of an ellipse:

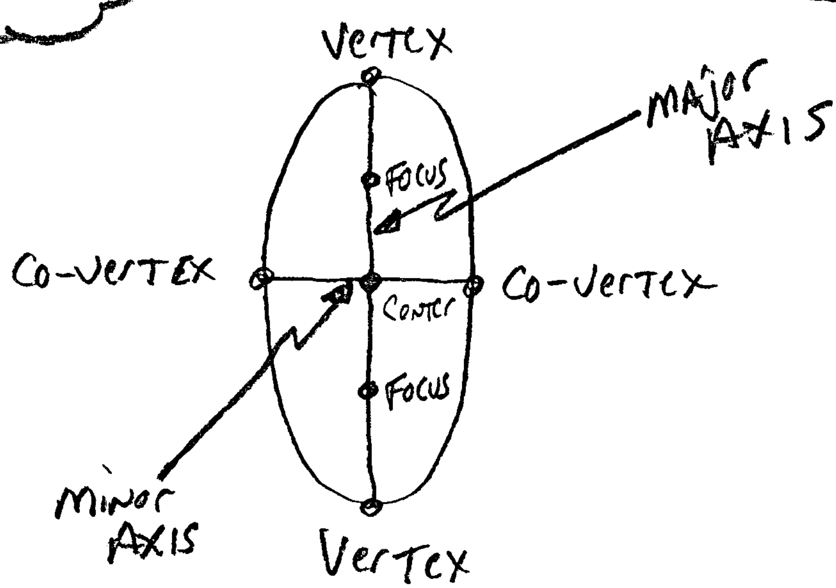


* Think of this as the minor radius

* Even though a ellipse does not actually have a radius

* think of this as the major radius

Left-Right Ellipse



UP-DOWN ELLIPS

Comparing the Equations of Circles and Ellipses

Circle: $(x-h)^2 + (y-k)^2 = r^2$

Divide by r^2, the only radius

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

same numbers $r = \sqrt{r^2}$

Ellipse (left-right)

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

different $a^2 > b^2$

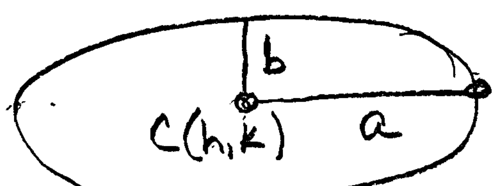
Because number under x term is bigger

major axis

a = half of major axis (r_{major})

b = half of minor axis (r_{minor})

NOTE: If a^2 and b^2 are same you have a circle



Ellipse (up-down)

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

$a^2 > b^2$,

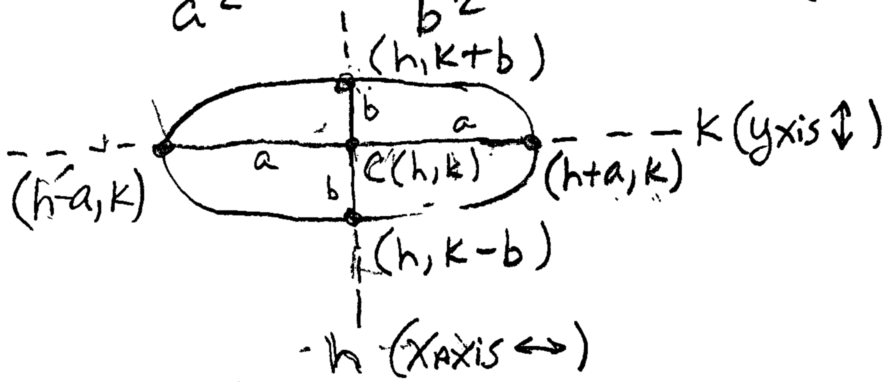
"opens" up-down axis more,

∴ major axis is up-down

Summary: How to find all the parts of an ellipse. (Pg 832 table)

Left-Right Ellipse (horizontal)

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



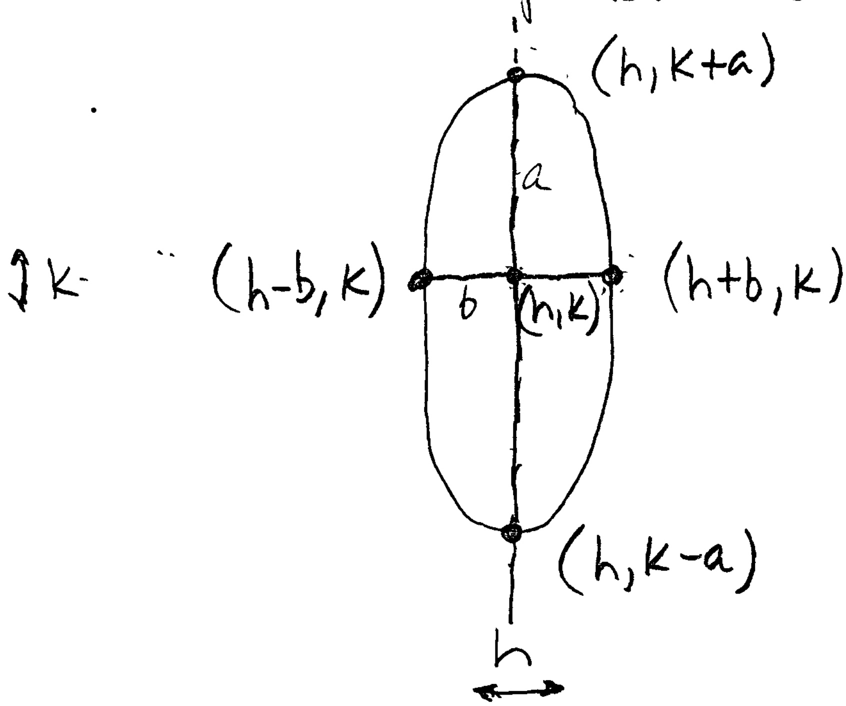
To get Foci, you need this formula for ellipses:

C = memory aid

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

Then Foci are at $(h+c,k)$ and $(h-c,k)$

Up-Down Ellipse (Vertical)



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

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

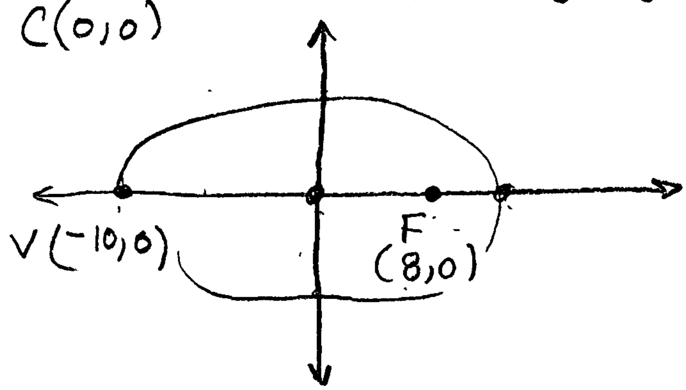
$\therefore$ Foci:

$(h,k+c), (h,k-c)$

Foci always on major axis

Ex 2 WRITE THE STANDARD form OF the Ellipse graphed below:

Pg 831



* GIVEN VERTICES AND FOCI AND CENTER

LEFT-RIGHT $\Rightarrow a = 10 \therefore a^2 = 100$

$C(h,k) \Rightarrow (0,0)$ h k

$$\frac{(x-0)^2}{100} + \frac{(y-0)^2}{b^2} = 1$$

but $\underline{\underline{c}} = 8 \therefore c^2 = 64$ AND $\boxed{c^2 = a^2 - b^2}$ *

FOCI

$\therefore 64 = 100 - b^2$

$b^2 = 36$

$b = 6$

$$\therefore \boxed{\frac{x^2}{100} + \frac{y^2}{36} = 1}$$ EOE

"major radius" = 10 "minor radius" = 6

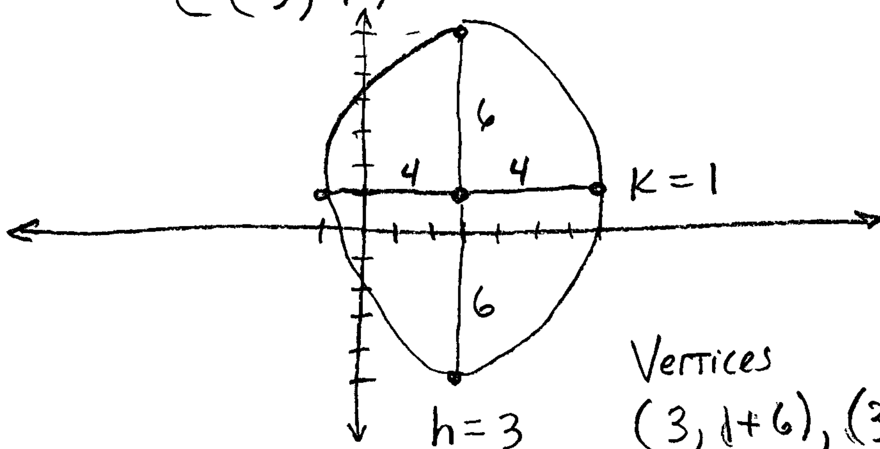
Ex3 Graphing the ellipse:
pg 832

$$\frac{(x-3)^2}{16} + \frac{(y-1)^2}{36} = 1$$

$b^2 \therefore b = 4$ "minor radius"

$a^2 \therefore a = 6$, up-down ellipse "major radius"

$C(3, 1)$



Vertices
$(3, 1+6), (3, 1-6)$
$\boxed{V(3,7), V(3,-5)}$

Co-Vertices
$(3+4, 1), (3-4, 1)$
$\boxed{CV(7,1), CV(-1,1)}$

NOTE: the focal points ARE NOT needed to graph the ellipse as they ARE NOT ON the ellipse.

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

$c^2 = 36 - 16 = 20$

$c = \sqrt{20} = 2\sqrt{5}$

$\boxed{\text{Foci } (3, 1+2\sqrt{5}),\ (3, 1-2\sqrt{5})}$