PROJECTED WRITTEN NOTES FROM THE VIDEO

CONIC SECTIONS : ELLIPSES

Ellipses : $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ OR $\dfrac{x^2}{b^2} + \dfrac{y^2}{a^2} = 1$

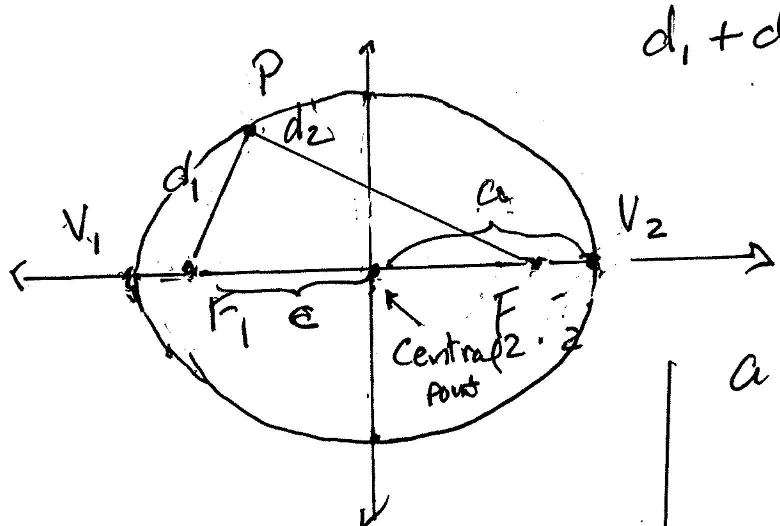
$a > b > 0$

General Definition : Given two points F_1, F_2 (Foci)

and a number $L = 2a$

$d_1 + d_2 = L$

$\overline{V_1V_2}$ is the MAJOR Axis



a = The distance from the central point to a Vertex

For an Ellipse,

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

L = length of the MAJOR AXIS

c = The distance from the central point to a Focus

The Foci and Vertices are on the axis of the variable that a^2 is under.

a^2 is the LARGER OF the two denominators.

Ellipses

4 The ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \qquad a \geqslant b > 0$$

has foci $(\pm c, 0)$, where $c^2 = a^2 - b^2$, and vertices $(\pm a, 0)$.

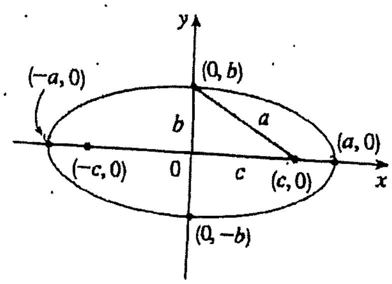


FIGURE 8
$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1,\ a \geqslant b$

5 The ellipse

$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1 \qquad a \geqslant b > 0$$

has foci $(0, \pm c)$, where $c^2 = a^2 - b^2$, and vertices $(0, \pm a)$.

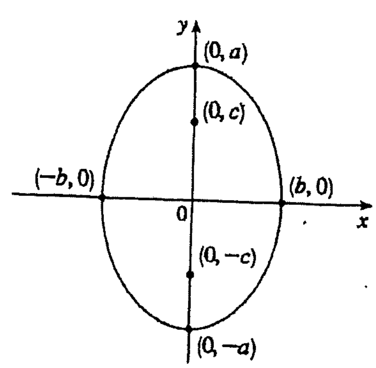
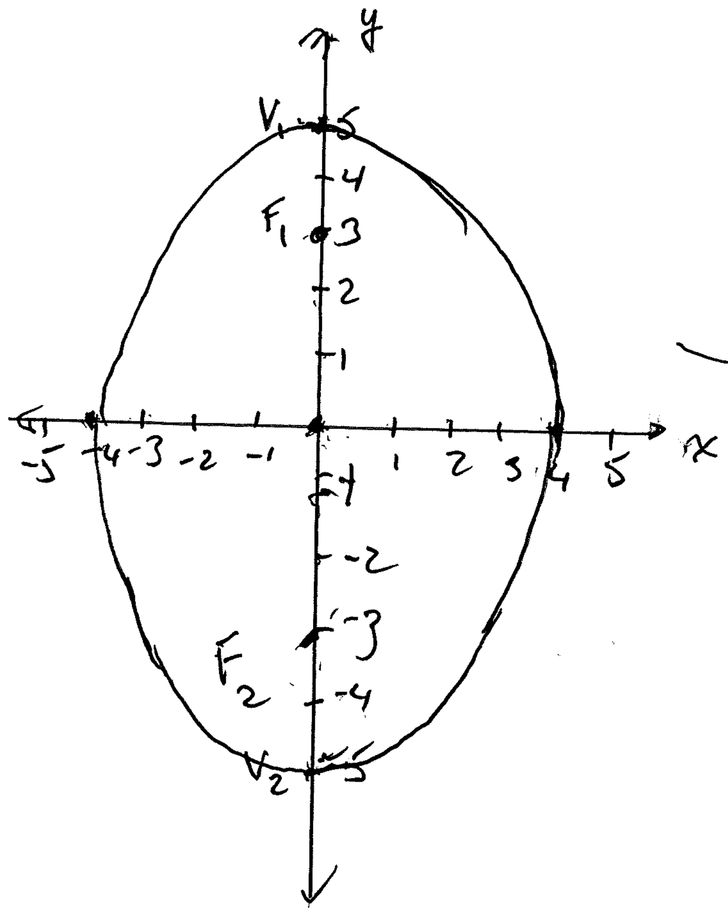


FIGURE 9
$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1,\ a \geqslant b$

Problem: Find the Foci and Vertices and sketch the curve for

$$\frac{x^2}{16} + \frac{y^2}{25} = 1$$

$b^2 = 16$, $a^2 = 25$



$a^2 = 25 \Rightarrow a = 5$

$b^2 = 16 \Rightarrow b = 4$

$c^2 = a^2 - b^2 = 25 - 16 = 9$

$c = 3$

The foci and vertices are on the y-axis

Foci: $(0, 3)$, $(0, -3)$

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

Summary of the Standard Equation Forms of Conics (UNSHIFTED)

PARABOLAS:

$x^2 = 4py,\ p \neq 0$ OR $y^2 = 4px,\ p \neq 0$

THE FOCUS is $(0, p)$.	THE FOCUS is $(p, 0)$.
THE Directrix is "$y = -p$."	THE Directrix is "$x = -p$."

In BOTH CASES: THE VERTEX is the Origin $(0,0)$.

THE FOCUS is on the axis of the Degree 1 Variable.

$|p|$ = The Distance: VERTEX TO FOCUS.

FOR ELLIPSES AND HYPERBOLAS (BOTH)

a = the DISTANCE: CENTER TO EACH VERTEX.

c = the DISTANCE: CENTER TO EACH FOCUS.

THE FOCI AND VERTICES ARE ON THE AXIS OF the Squared Variable that is over a^2.

ELLIPSES:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad \text{OR} \quad \frac{x^2}{b^2} + \frac{y^2}{a^2} = 1 \quad \text{where} \begin{cases} a > b > 0 \\ c^2 = a^2 - b^2 \\ c < a \end{cases}$$

a^2 is the LARGER DENOMINATOR.

The FOCI AND VERTICES LIE ON THE AXIS of the Variable OVER a^2.

HYPERBOLAS:

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \quad \text{OR} \quad \frac{y^2}{a^2} - \frac{x^2}{b^2} = 1 \quad \text{where} \begin{cases} c^2 = a^2 + b^2 \\ c > a \end{cases}$$

a^2 is the denominator under the ADDED Squared Variable.

THE FOCI ARE ON THE AXIS OF THE ADDED Squared Variable.

The asymptotes are lines along the DIAGONALS of the "BOX"