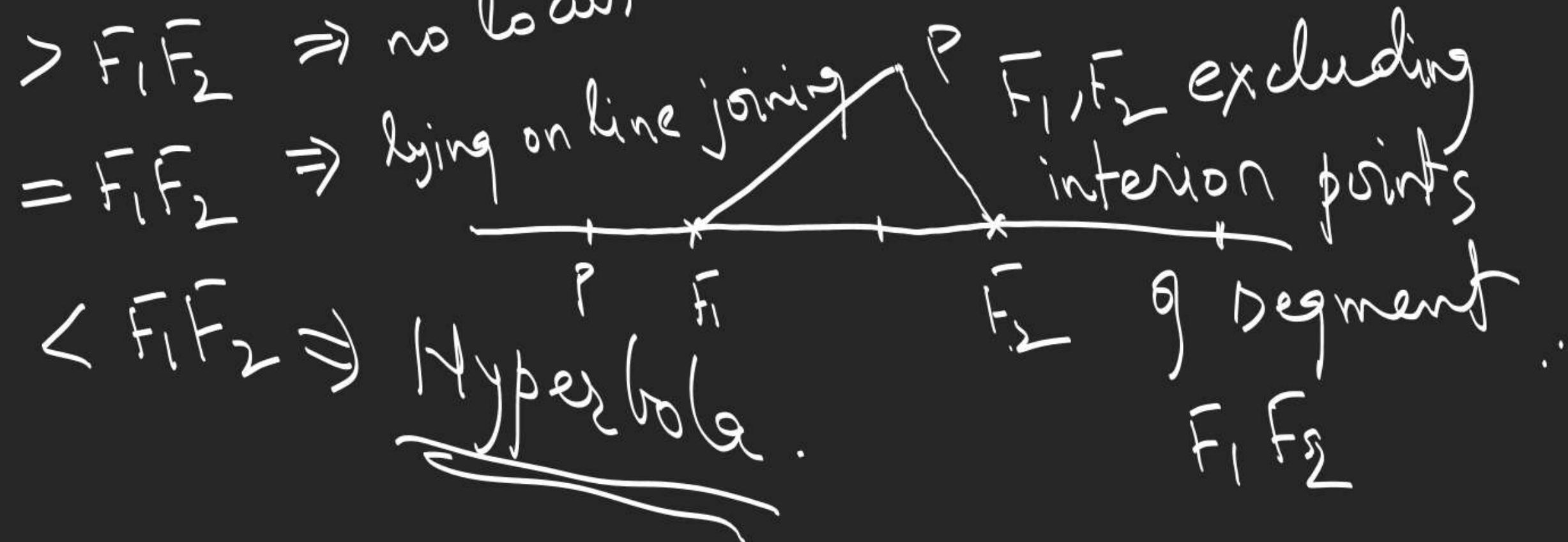


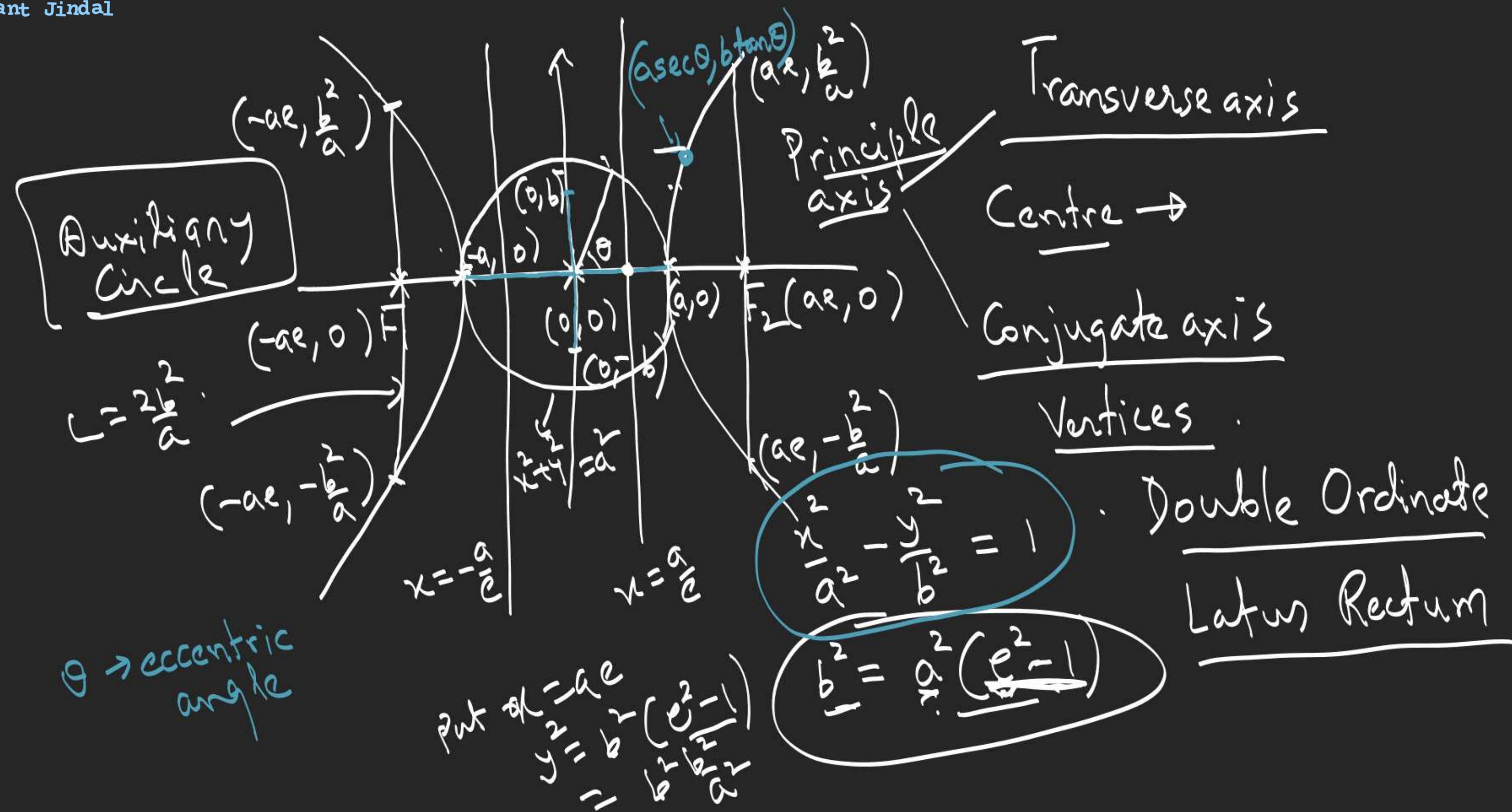
# Hyperbola:

$|PF_1 - PF_2| = \text{const.} = 2a$  ,  $F_1, F_2$  fixed points  
locus of  $P$ .

$2a > F_1 F_2 \Rightarrow$  no locus



$< F_1 F_2 \Rightarrow$  Hyperbola.

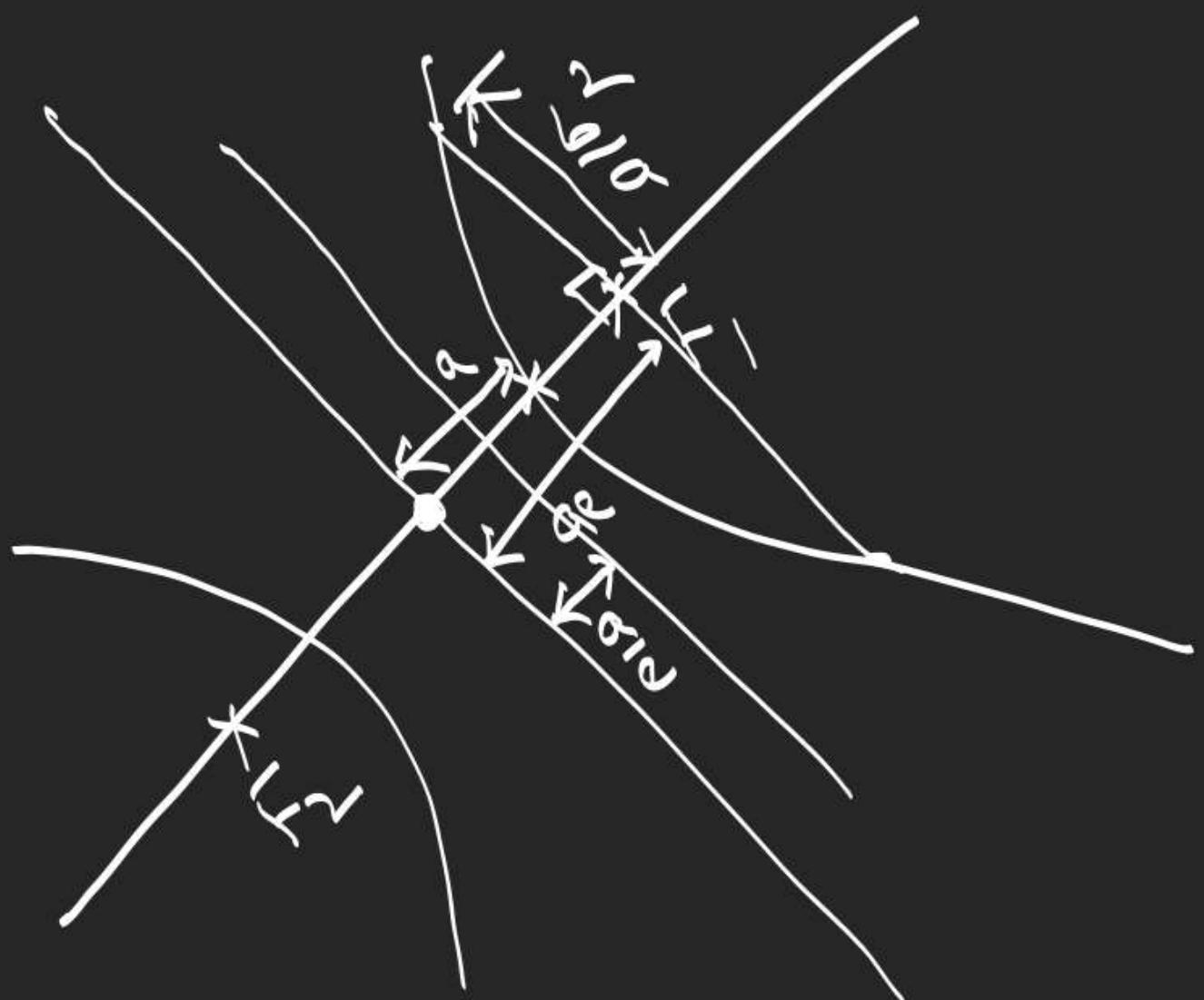


## Equation of Hyperbola

$$\frac{\text{Distance of any point 'P' on Hyperbola from Conjugate axis}}{(\text{Semi TA})^2}$$

$$- \frac{\text{Distance of 'P' from TA}}{(\text{Semi CA})^2} = 1$$

$$(\text{Semi CA})^2 = (\text{Semi TA})^2 (e^2 - 1)$$

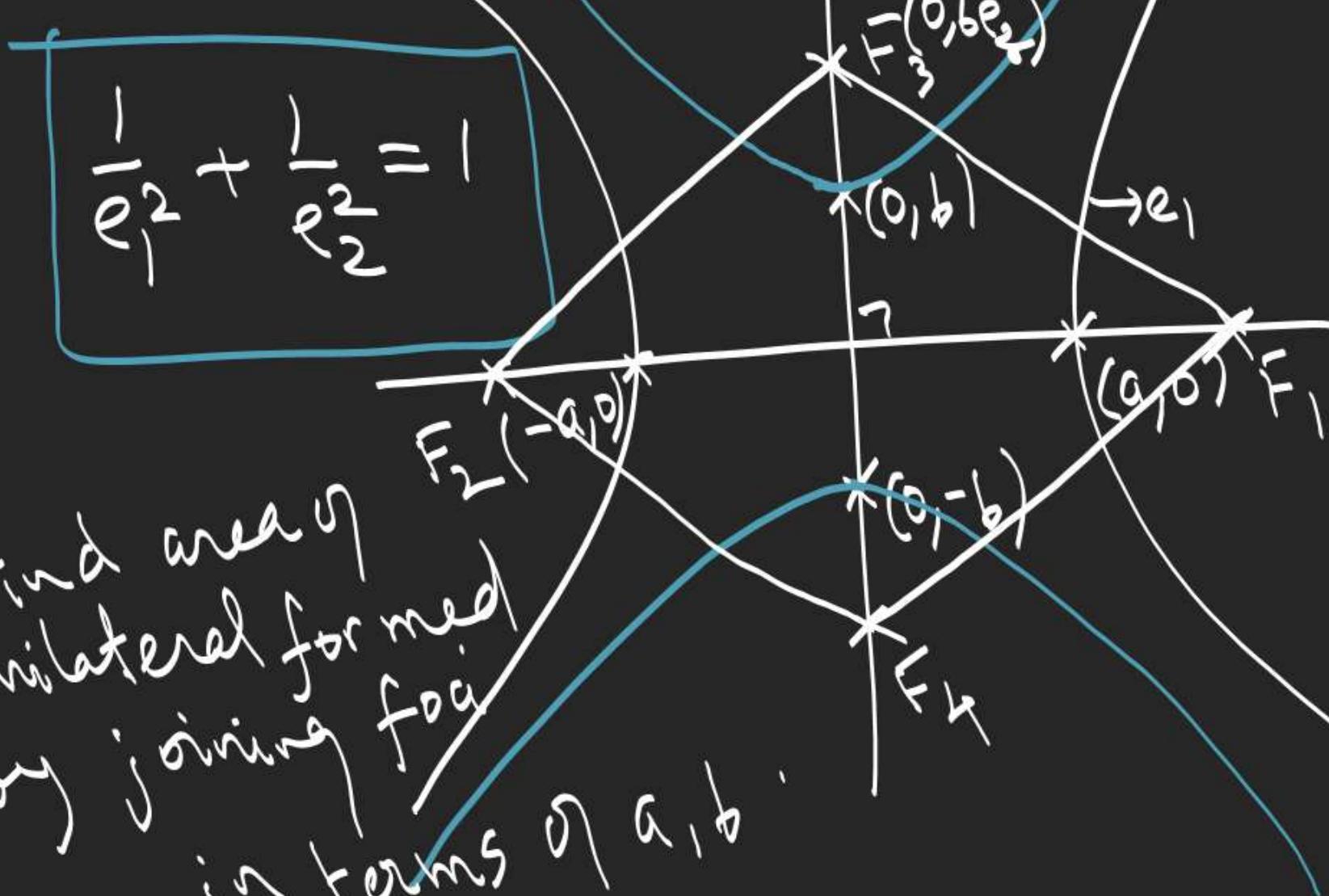


$$a = \text{Semi } TA$$

$$b = \text{Semi } CA$$

# Conjugate Hyperbola

$$2(a^2 + b^2) = \frac{1}{2} (2ae_1)^2 = A \cdot e_2 \rightarrow \frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$$



Find area of quadrilateral formed by joining foci in terms of  $a, b$ .

$$b^2 = a^2(e_1^2 - 1) \Rightarrow a^2 + b^2 = \frac{a^2 e_1^2}{e_1^2 - 1}$$

$$a^2 = b^2(e_2^2 - 1) \Rightarrow a^2 + b^2 = \frac{b^2 e_2^2}{e_2^2 - 1}$$

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \quad \frac{\frac{1}{e_1^2} + \frac{1}{e_2^2}}{\frac{1}{e_2^2} - \frac{1}{e_1^2}} = \frac{\frac{a^2}{a^2 + b^2} + \frac{b^2}{a^2 + b^2}}{\frac{b^2}{a^2 + b^2} - \frac{a^2}{a^2 + b^2}} = 1$$

# Rectangular Hyperbola

$$TA = CA$$

$$e = \sqrt{2}$$

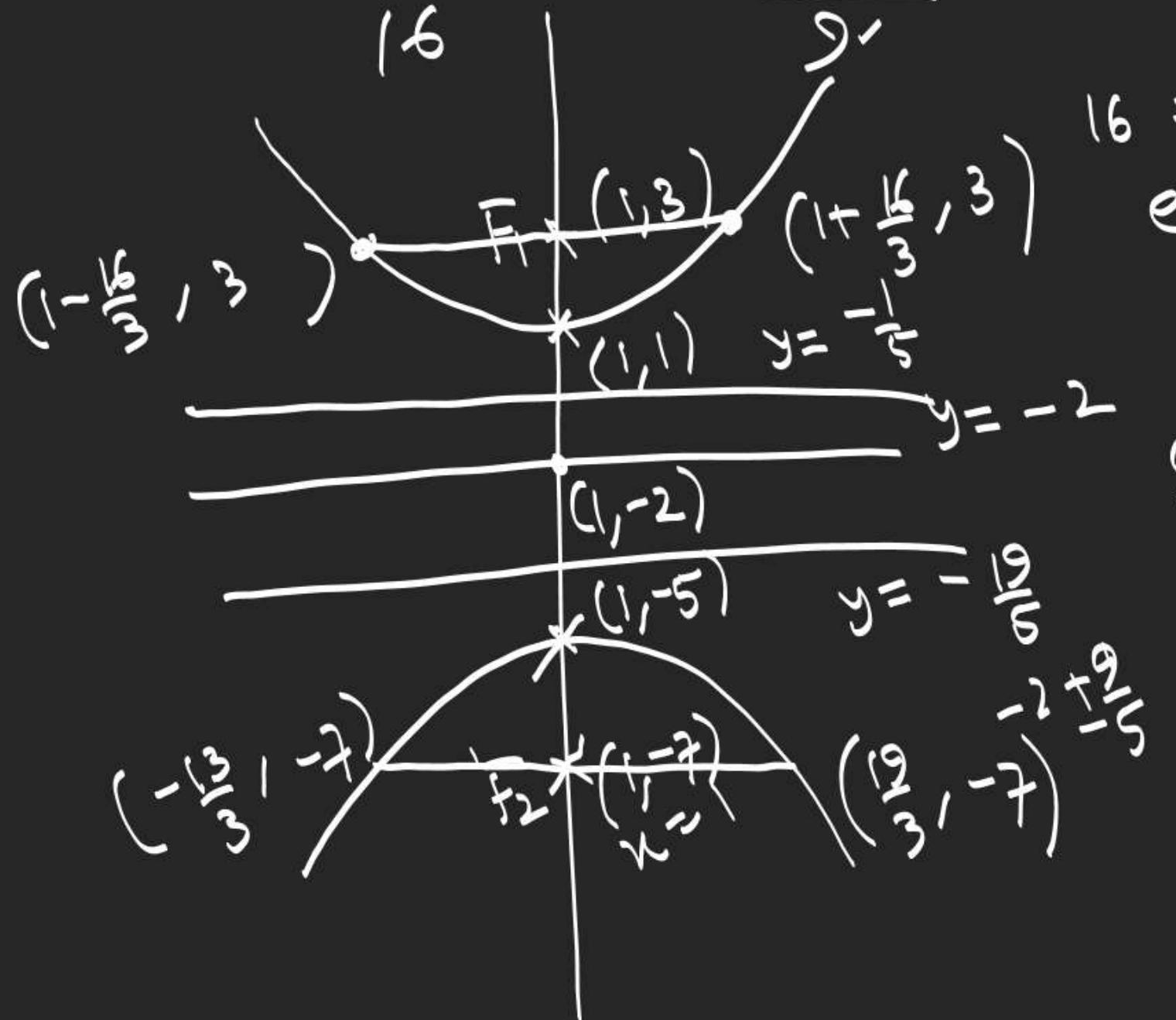
$$\frac{x^2}{a^2} - \frac{y^2}{a^2} = 1$$

$$x^2 - y^2 = a^2$$

$$a^2 = a^2(e^2 - 1)$$

$$\perp \quad 9x^2 - 18x - 16y^2 - 64y + 89 = 0$$

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



$$16 = 9(e^2 - 1)$$

$$e = \frac{5}{3}$$

$$ae = 5$$

$$\frac{a}{e} = \frac{9}{5}$$

$$\frac{b^2}{a} = \frac{16}{3}$$

Parabola  $\rightarrow \{x=3\}$  (remaining)  
 Ellipse  $\rightarrow \{x=1\}$  (complete)

2. Given the base of a triangle and the ratio of tangents of half the base angles. Find the locus of vertex of triangle.