Nishant Jindal

Ellipse

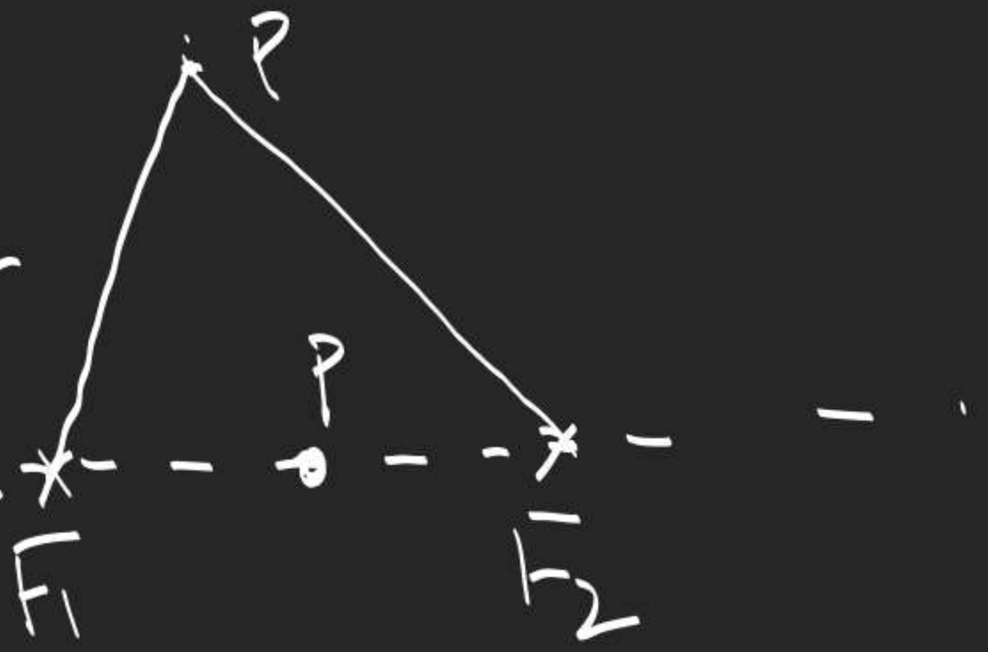
$PF_1 + PF_2 = \text{const} = \boxed{2a}$, $F_1, F_2 \to$ fixed points

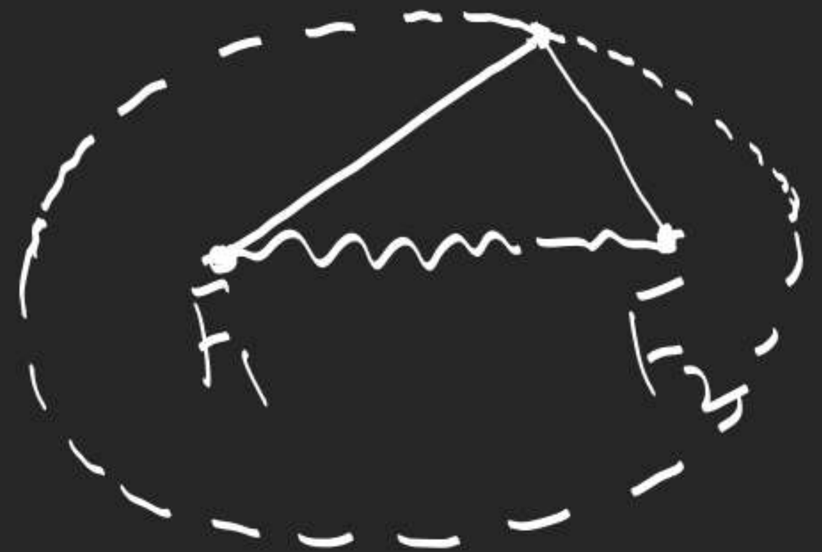
locus of $P = ?$

If $2a < F_1F_2 \Rightarrow$ no locus

$2a = F_1F_2 \Rightarrow$ line segment F_1F_2

$\boxed{2a > F_1F_2} \Rightarrow$ Ellipse





Nishant Jindal

$\times (x, y)$

$F_1F_2 < 2a$

$\boxed{c < a}$

$(-c, 0) F_1 \qquad F_2(c, 0)$

$$\sqrt{(x+c)^2+y^2} + \sqrt{(x-c)^2+y^2} = 2a$$

$$(x+c)^2 + \cancel{y^2} = 4a^2 + (x-c)^2 + \cancel{y^2} - 4a\sqrt{(x-c)^2+y^2}$$

$$(cx-a^2)^2 = a^2\left(x^2 + c^2 - 2cx + y^2\right)$$

$$(a^2-c^2)x^2 + a^2y^2 = a^2(a^2-c^2)$$

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

$$\boxed{\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, \; b^2 = a^2 - c^2}$$

$$\boxed{\begin{gathered}\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \\ b^2 = a^2 - c^2\end{gathered}}$$

Nishant Jindal

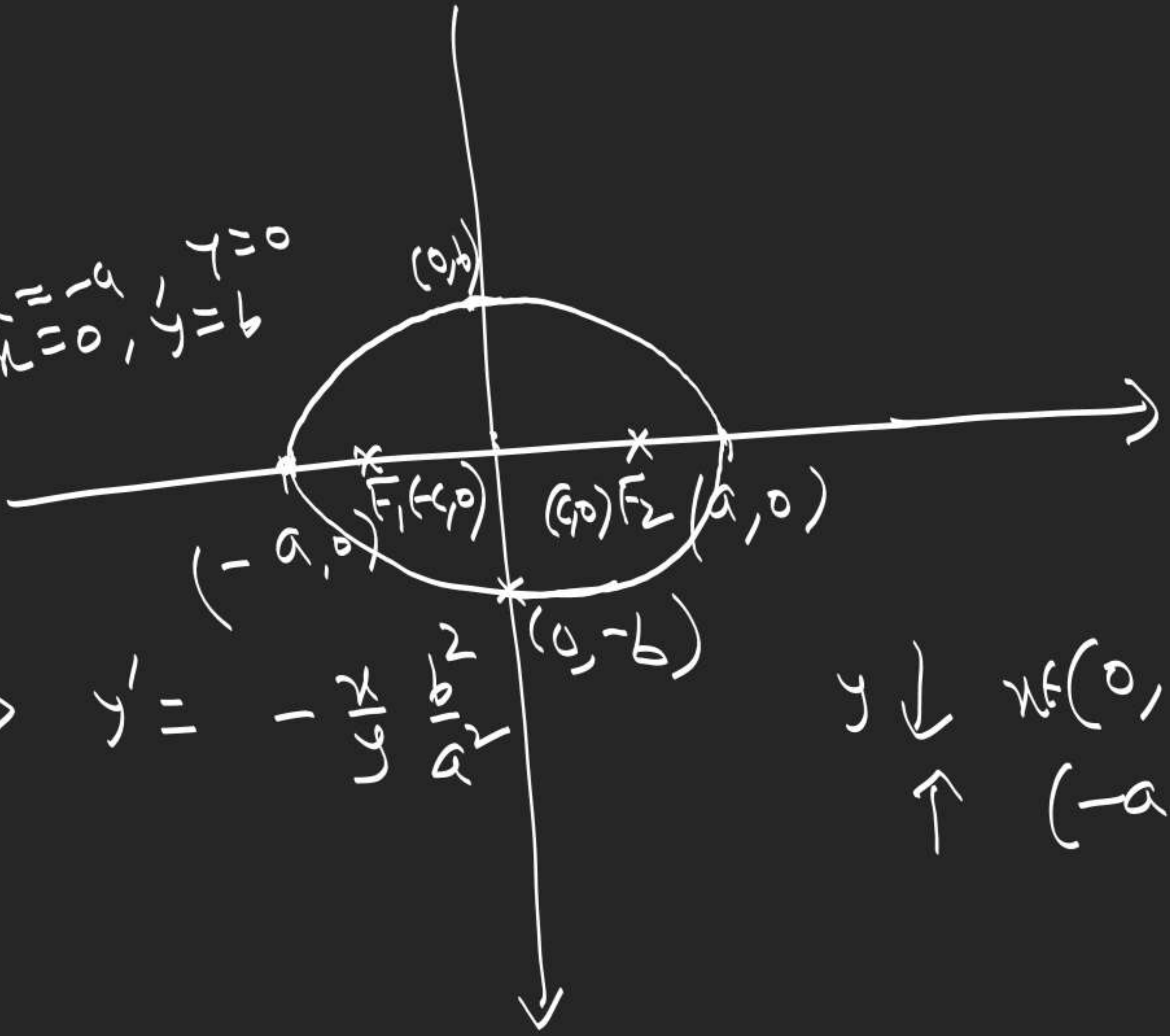
$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$

$$\frac{x^2}{a^2}\le 1$$

$$\boxed{-a, a}$$

$x=-a,\ y=0$

$x=0,\ y=b$



$y>0$

$$\frac{x}{a^2}+\frac{yy'}{b^2}=0 \Rightarrow y'=-\frac{x}{y}\frac{b^2}{a^2}$$

$y \downarrow \quad x \in (0,a)$

$\uparrow \quad (-a,0)$ ✓

$$\frac{1}{a^2}+\frac{y y''}{b^2}+\frac{(y')^2}{b^2}=0$$

<0

$$\boxed{y''<0}$$

Nishant Jindal

$F_1, F_2 \to$ foci

Major axis

Centre

Minor axis

Principle axis

Vertices $\to$

Double Ordinate $\to$

$\boxed{\text{Latus Rectum} \to}$

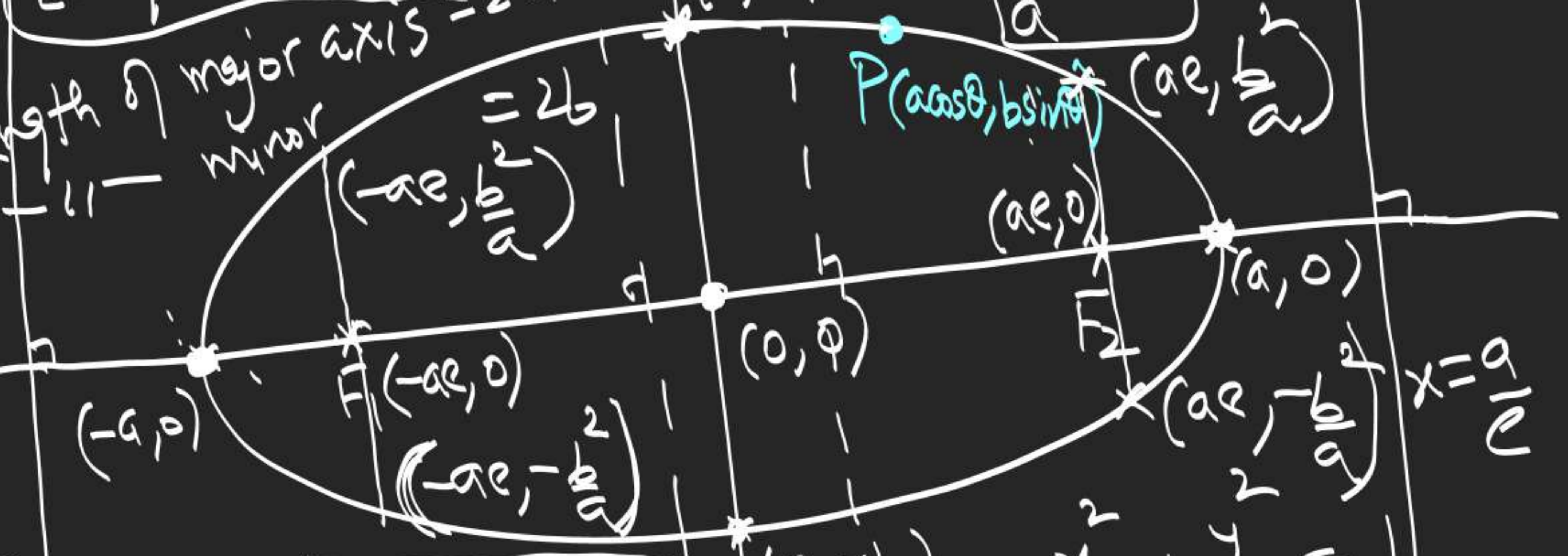
$$e = \frac{-ae+a}{-a+\frac{a}{e}}$$

$\boxed{\text{Length of LR} = \frac{2b^2}{a}}$

Length of major axis $= 2a$

— " — minor $= 2b$

$\boxed{\frac{c}{a} = e}$



$$\boxed{\frac{x^2}{a^2}+\frac{y^2}{b^2}=1 \qquad b^2 = a^2(1-e^2)}$$

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

$\theta \to$ eccentric angle

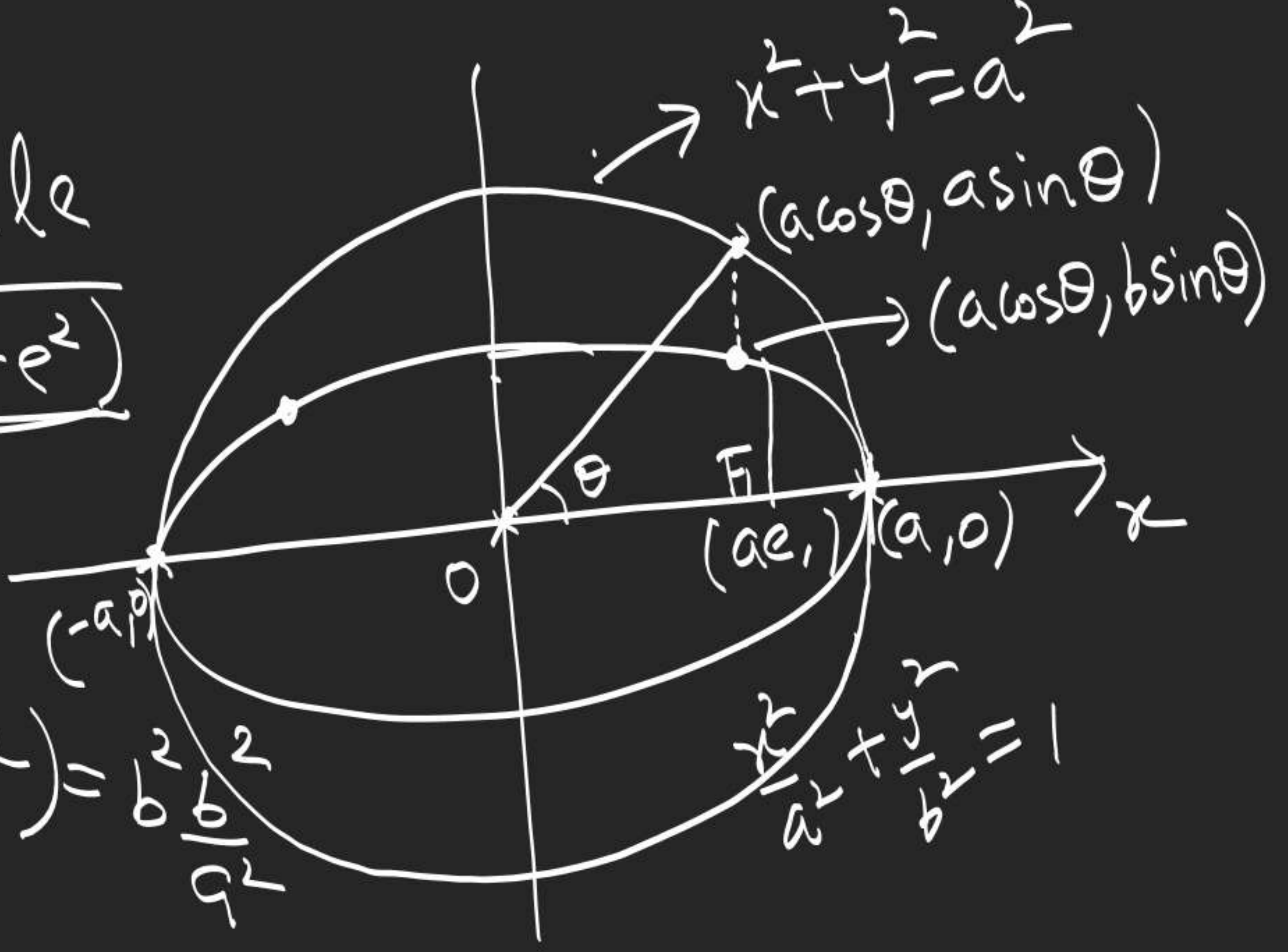
$$\text{eccentricity} = \frac{\text{Distance b/n centre \& focus}}{\text{Distance b/n centre \& vertex}}$$

Auxiliary Circle

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

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

$$y^2 = b^2(1-e^2) = b^2\frac{b^2}{a^2}$$



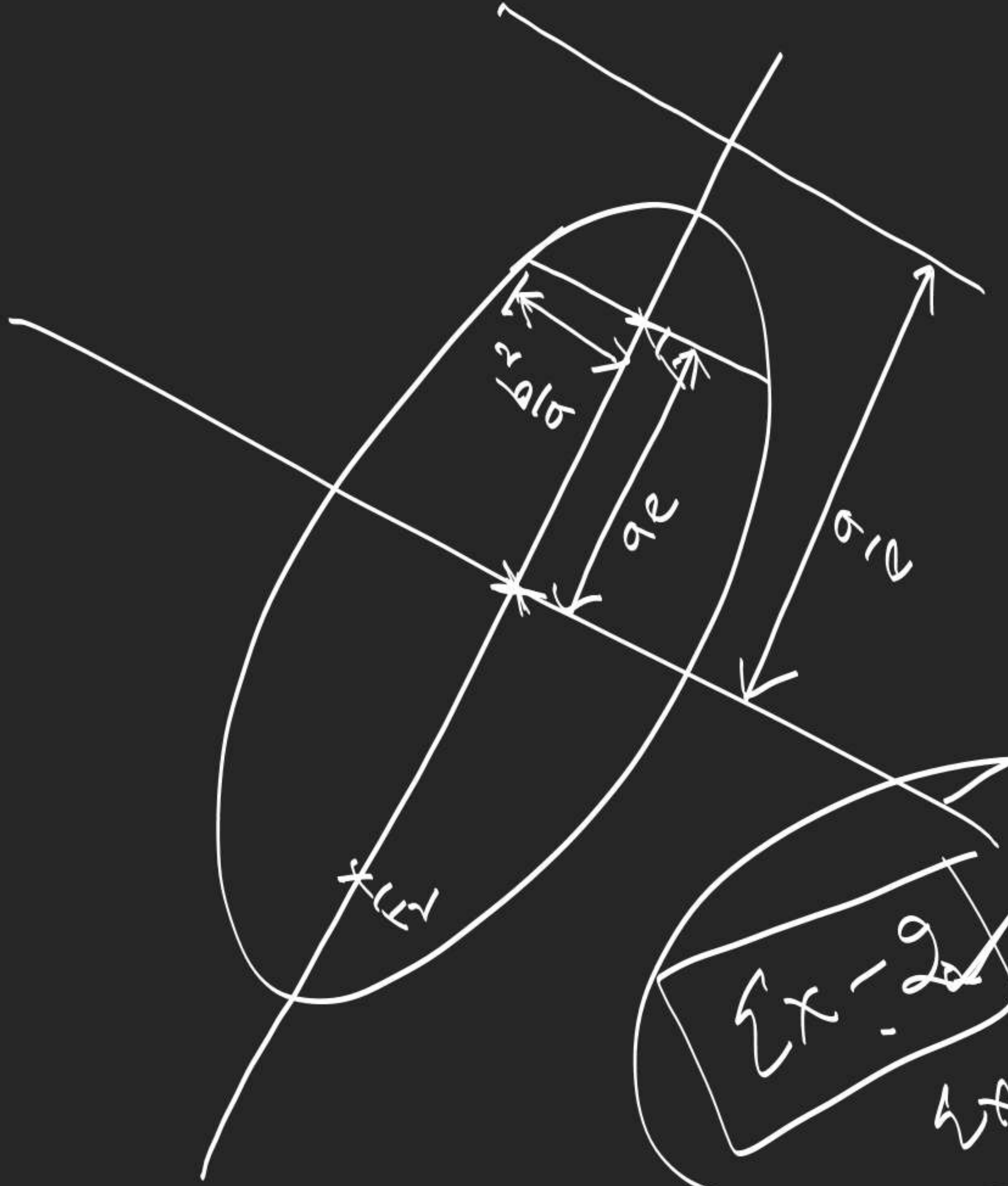
Nishant Jindal

Eqn. of Ellipse

$$\frac{(\perp ar\ \text{distance of point 'P' on Ellipse from minor axis})^2}{(\text{Semi major})^2} + \frac{(\perp ar\ \text{distance of 'P' from major axis})^2}{(\text{Semi minor})^2} = 1$$

$$(\text{Semi minor})^2 = (\text{Semi major})^2 (1 - e^2)$$

Nishant Jindal



a = semi major
b = semi minor.

Ex-2

Ex-3 (1-5) → Friday