

NDA 1 2025

LIVE

MATHS

ANALYTICAL GEOMETRY 2D

CLASS 3

NAVJYOTI SIR

SSBCrack
CLAMS

Crack
EXAMS



23 Oct 2024 Live Classes Schedule

8:00AM	23 OCTOBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	23 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 1 2025 LIVE CLASSES

11:30AM	GK - POLITY - LEGISLATIVE	RUBY MA'AM
1:00PM	CHEMISTRY - PHYSICAL-CHEMICAL CHANGES & REDOX REACTIONS	SHIVANGI MA'AM
✓ 4:00PM	MATHS - ANALYTICAL GEOMETRY 2D - CLASS 3	NAVJYOTI SIR
5:30PM	ENGLISH - IDIOMS & PHRASES - CLASS 3	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

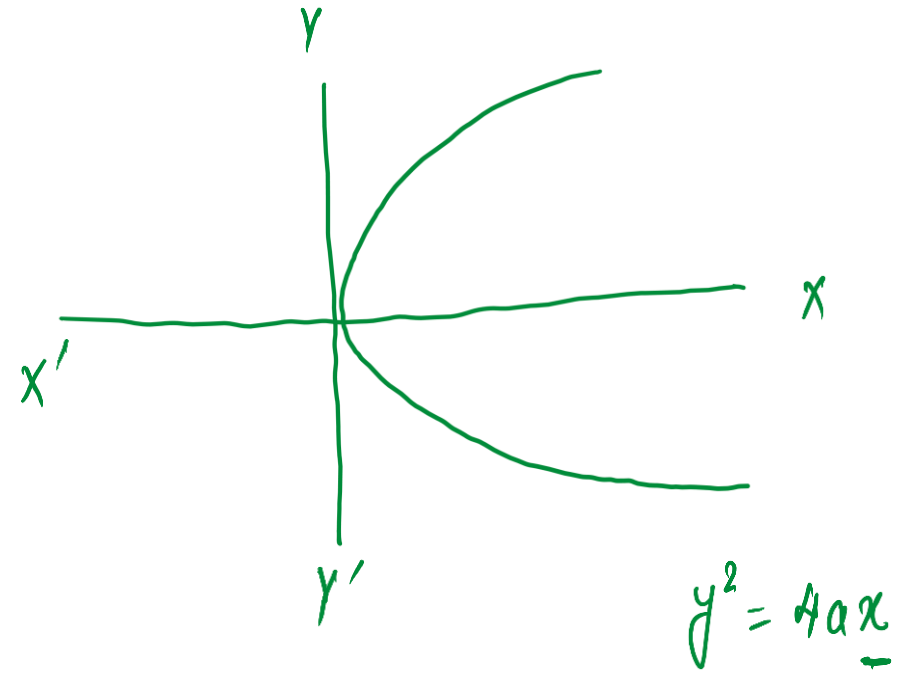
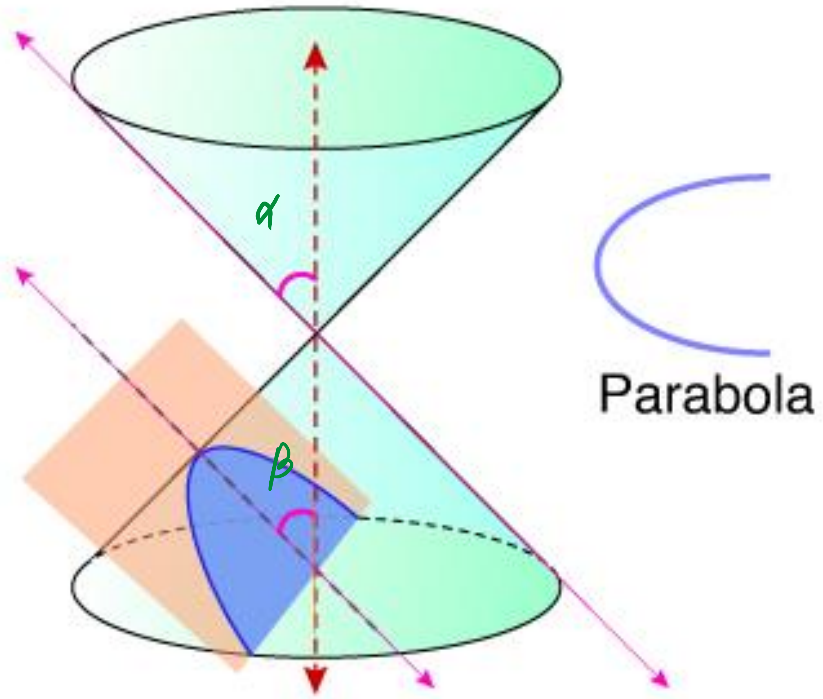
11:30AM	GK - POLITY - LEGISLATIVE	RUBY MA'AM
1:00PM	CHEMISTRY - PHYSICAL-CHEMICAL CHANGES & REDOX REACTIONS	SHIVANGI MA'AM
5:30PM	ENGLISH - IDIOMS & PHRASES - CLASS 3	ANURADHA MA'AM
7:00PM	MATHS - NUMBER SYSTEM - CLASS 4	NAVJYOTI SIR

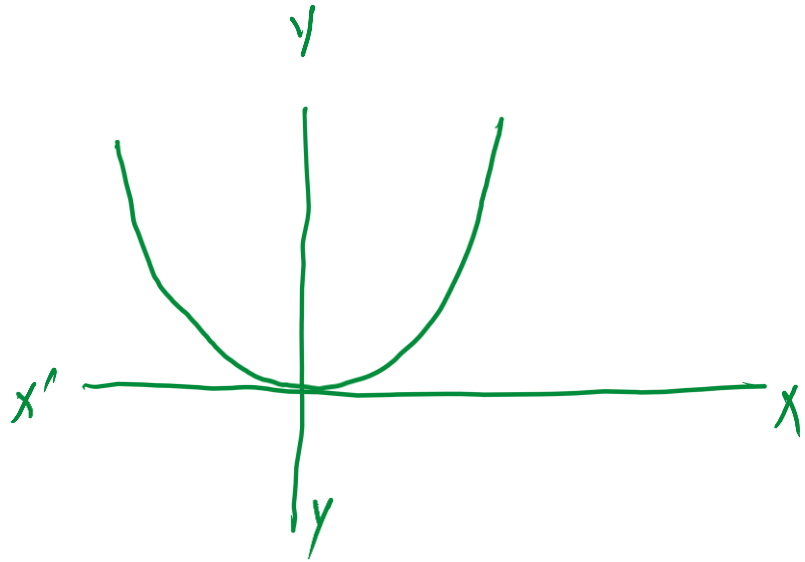
AFCAT 1 2025 LIVE CLASSES

4:00PM	STATIC GK - HISTORY - CLASS 1	DIVYANSHU SIR
5:30PM	ENGLISH - IDIOMS & PHRASES - CLASS 3	ANURADHA MA'AM
7:00PM	MATHS - NUMBER SYSTEM - CLASS 4	NAVJYOTI SIR

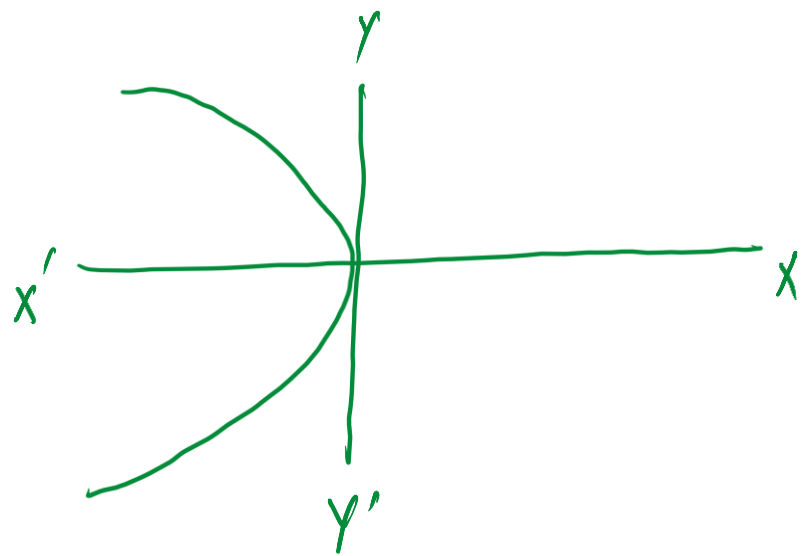


PARABOLA



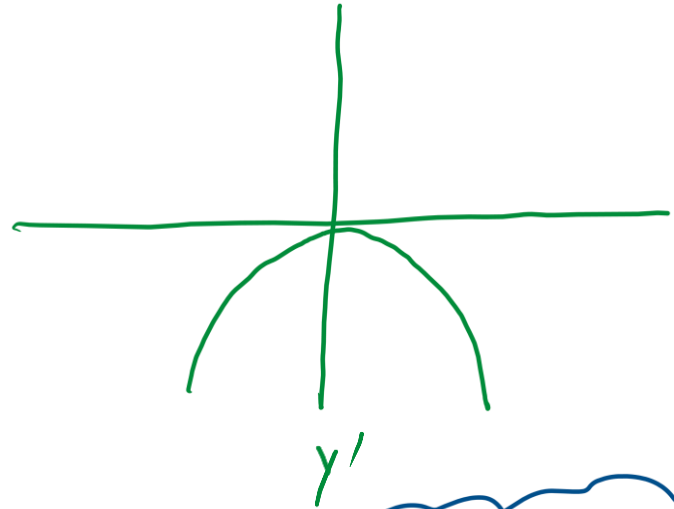


$$x^2 = 4ay$$



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

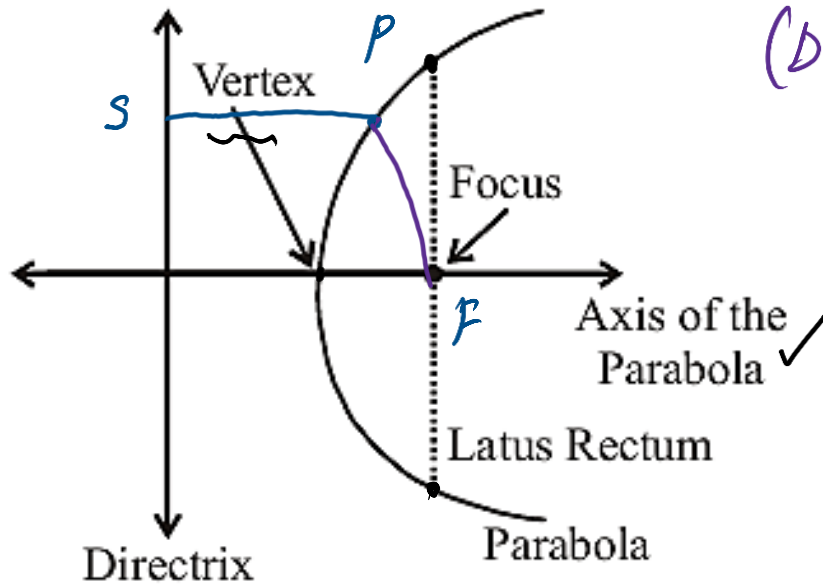
$$y^2 = -4ax$$



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

$$x^2 = -4ay$$

PARABOLA



$$PS = PF$$

(Distance from fixed line) = (Distance from a fixed point) Focus

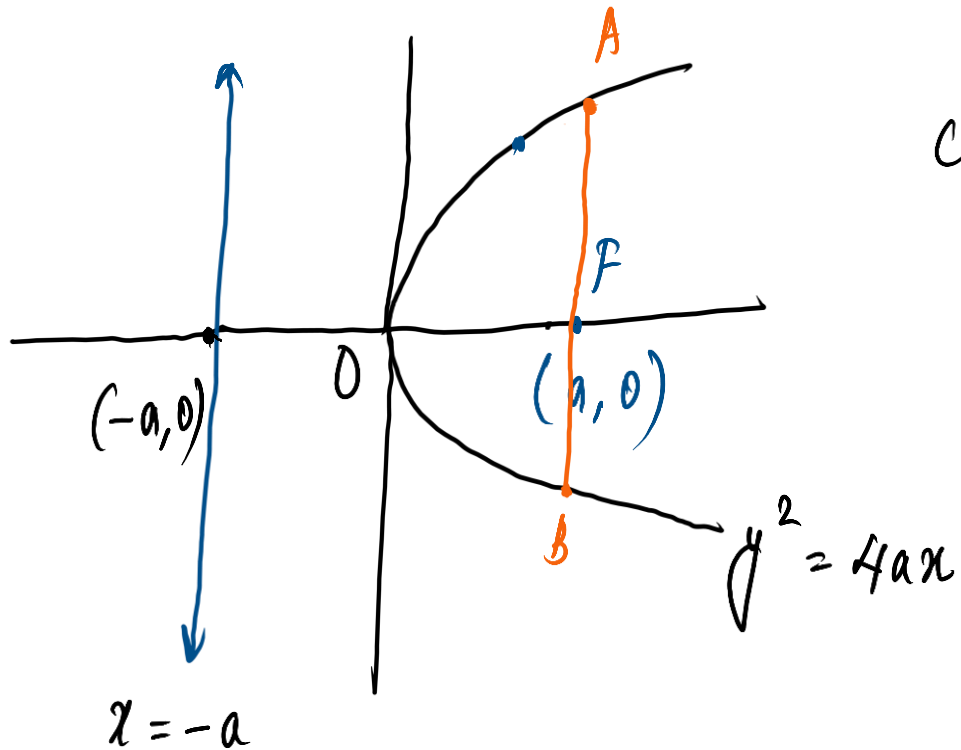
directrix

Eccentricity (e)

ratio of these two distances

for parabola, e = 1

PARABOLA



Axis \rightarrow x-axis ($y=0$)

Vertex \rightarrow origin $\rightarrow (0,0)$

Coordinates of focus $\rightarrow (a,0)$

Equation of directrix $\rightarrow x = -a \Rightarrow x+a=0$

Latus rectum = $AB = \underline{4a}$

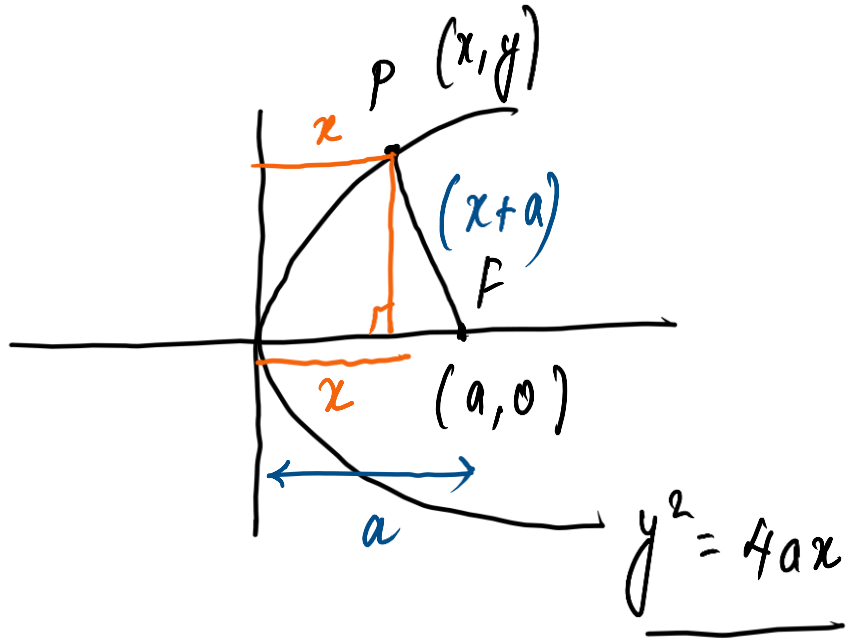
PARABOLA

$y^2 = -4ax$	$x^2 = 4ay$ ✓	$x^2 = -4ay$
$(0, 0)$	$(0, 0)$	$(0, 0)$
$(-a, 0)$	$(0, a)$	$(0, -a)$
$x - a = 0$	$y + a = 0$	$y - a = 0$
$y = 0$	$x = 0$	$x = 0$

→ Vertex
 → coordinates of focus
 → eqn of directrix
 → Axis

4a → Latus Rectum

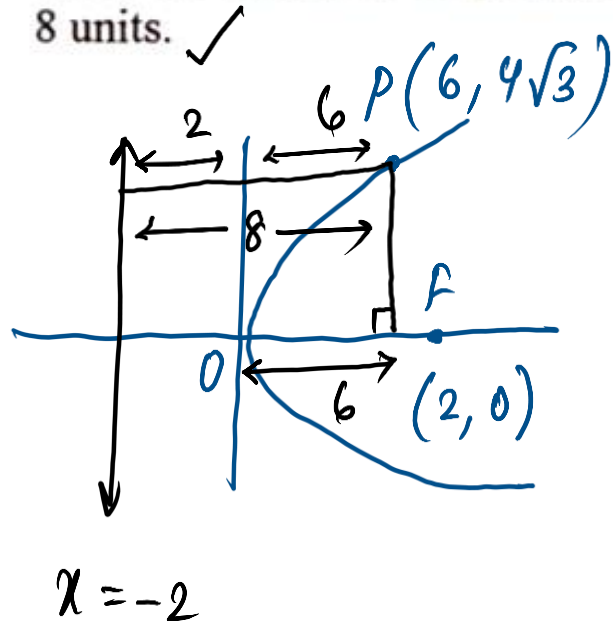
FOCAL DISTANCE OF PARABOLA



$$\begin{aligned}
 PF &= \sqrt{(x-a)^2 + y^2} \\
 &= \sqrt{x^2 + a^2 - 2ax + 4ax} \\
 &= \sqrt{(x+a)^2} \\
 &= \underline{x+a}
 \end{aligned}$$

In the parabola $y^2 = 8x$, the focal distance of a point P lying on it is 8 units. Which of the following statements is/are correct?

- The coordinates of P can be $(6, 4\sqrt{3})$. ✓
- The perpendicular distance of P from the directrix of parabola is 8 units. ✓



(PYQ - 2024 - I)

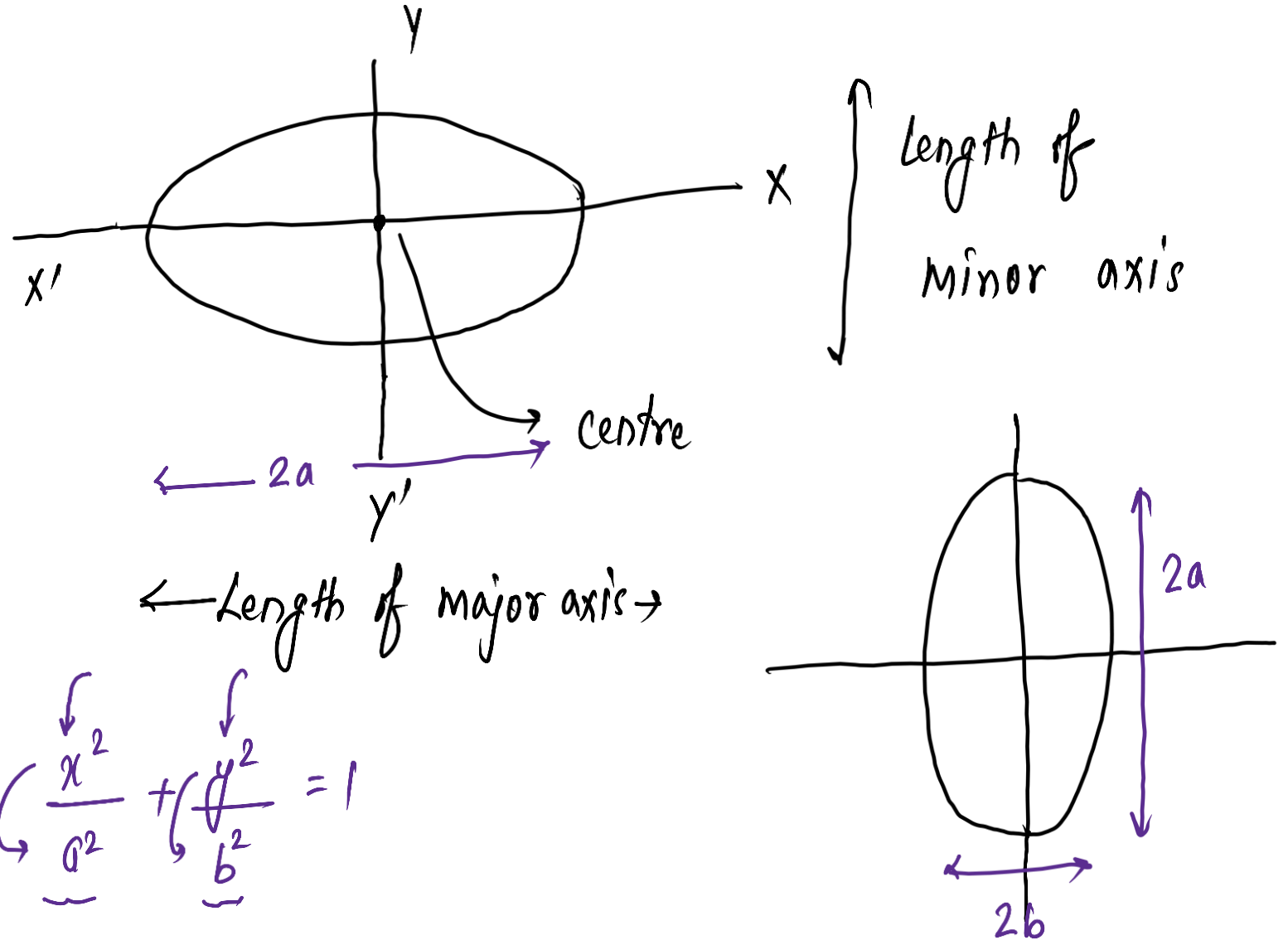
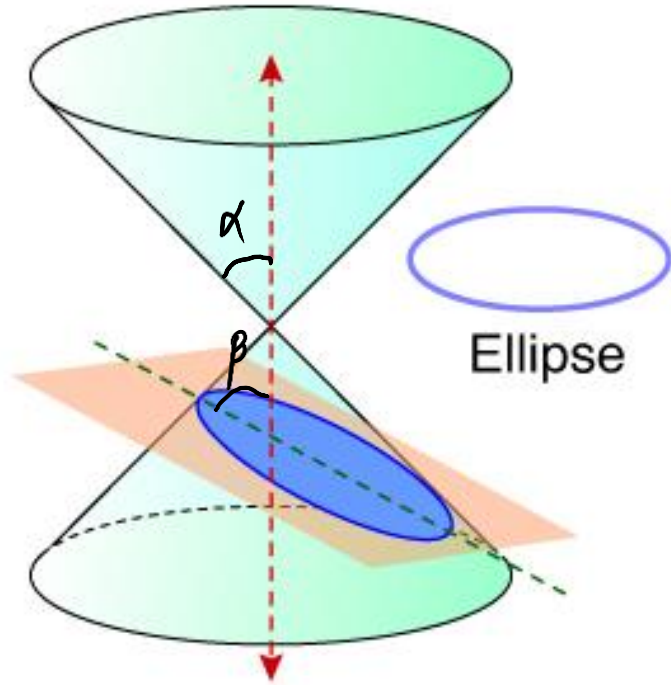
$$\left. \begin{aligned} y^2 &= 4ax \\ (y^2 &= 8x) \end{aligned} \right\} \begin{aligned} 4a &= 8 \\ a &= 2 \end{aligned}$$

focal distance = $x + a = 6 + 2 = 8$

$$\sqrt{(6-2)^2 + (4\sqrt{3})^2} = \sqrt{16 + 48} = \sqrt{64} = 8$$

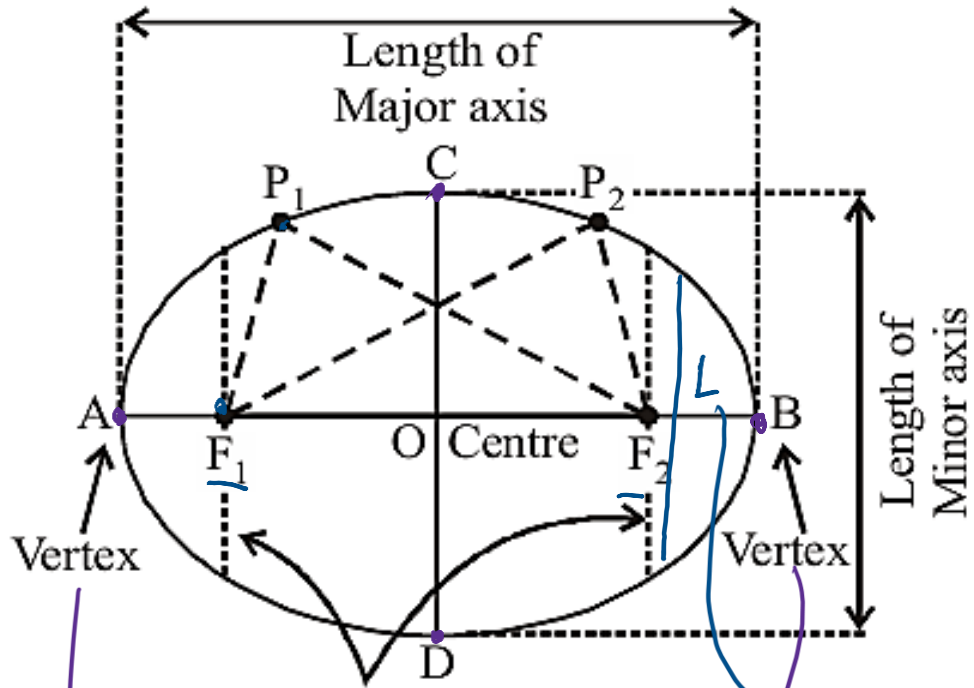
(Both the statements are correct)

ELLIPSE



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

ELLIPSE



$$P_1F_1 + P_1F_2 = 2a \text{ (length of major axis)}$$

$$\underline{P_2F_1} + \underline{P_2F_2} = 2a$$

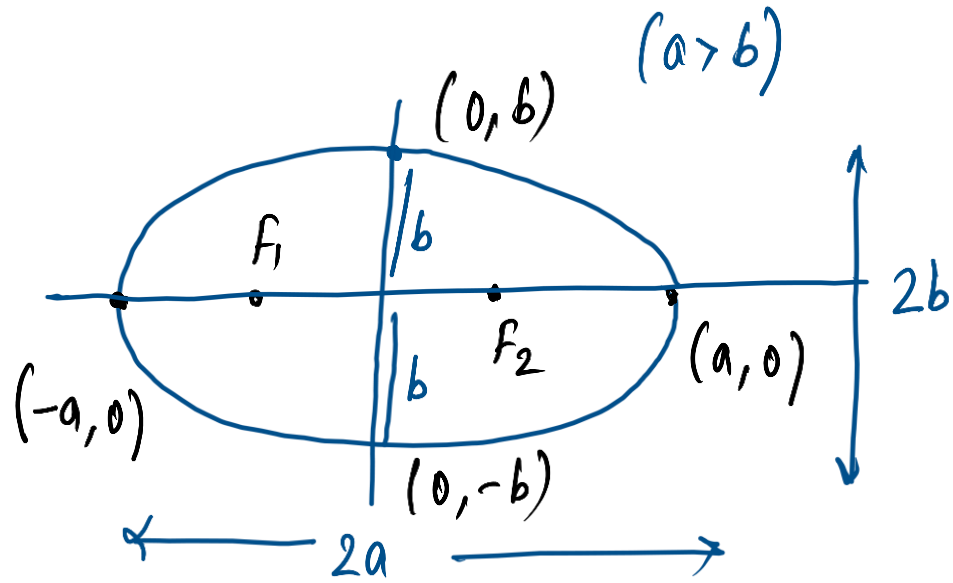
foci (2 focus)

Latus rectum

end points of major axis

eccentricity < 1
for ellipse

ELLIPSE



centre $\rightarrow (0, 0)$

vertices $\rightarrow (\pm a, 0)$

foci $\rightarrow (\pm ae, 0)$

latus rectum $\rightarrow \left(\frac{2b^2}{a} \right)$

eqn of ellipse,

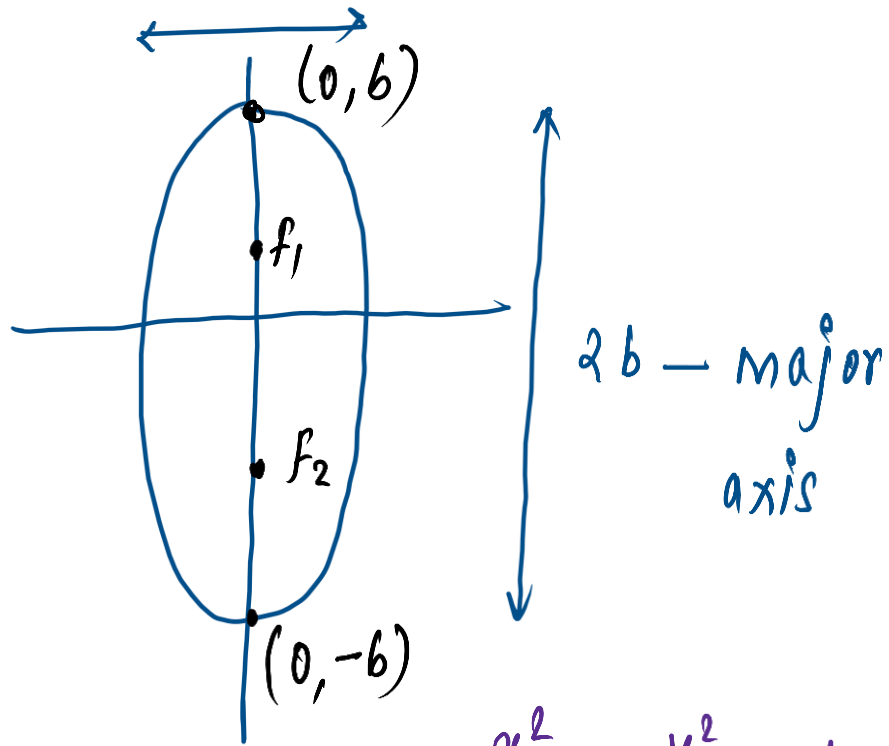
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

Relation between e , a and b

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

ELLIPSE

$2a$ — minor — axis



$(b > a)$

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

centre $\rightarrow (0, 0)$

vertices $\rightarrow (0, \pm b)$

focus $\rightarrow (0, \pm be)$

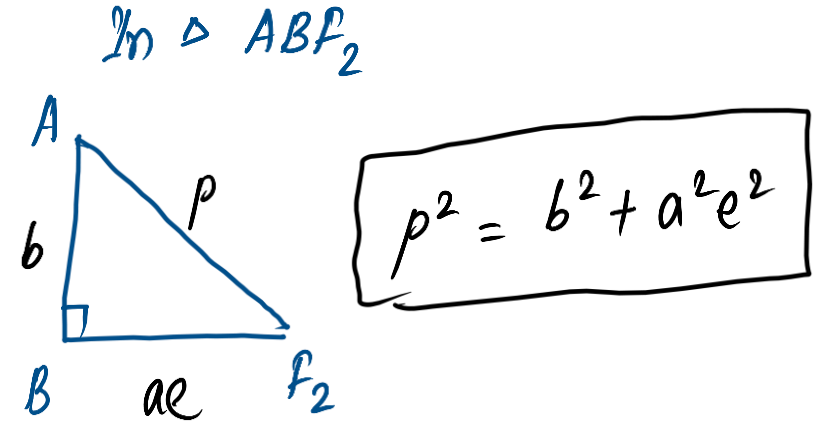
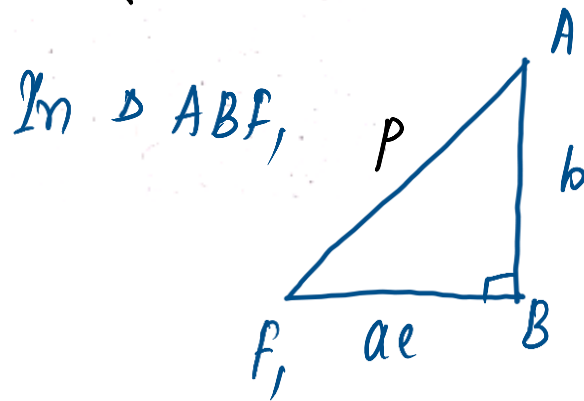
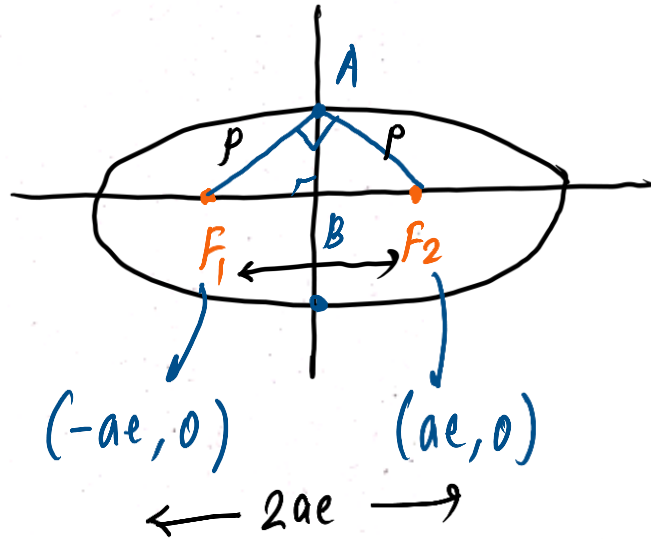
latus rectum $\rightarrow \frac{2b^2}{a}$

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

What is the eccentricity of the ellipse if the angle between the straight lines joining the foci to an extremity of the minor axis is 90° ?

(PYQ - 2024 - I)

- (a) $\frac{1}{3}$
- (b) $\frac{1}{2}$
- (c) $\frac{1}{\sqrt{3}}$
- (d) $\frac{1}{\sqrt{2}}$



$$p^2 = a^2e^2 + b^2$$

In $\triangle AF_1F_2$

$$p^2 + p^2 = (2ae)^2$$

$$2p^2 = 4a^2e^2$$

$$2p^2 = 4a^2e^2$$

$$p^2 = 2a^2e^2$$

$$b^2 + a^2e^2 = 2a^2e^2$$

$$b^2 = a^2e^2$$

$$\frac{b^2}{a^2} = e^2$$

$$\left(e^2 = 1 - \frac{b^2}{a^2} \Rightarrow \frac{b^2}{a^2} = 1 - e^2 \right)$$

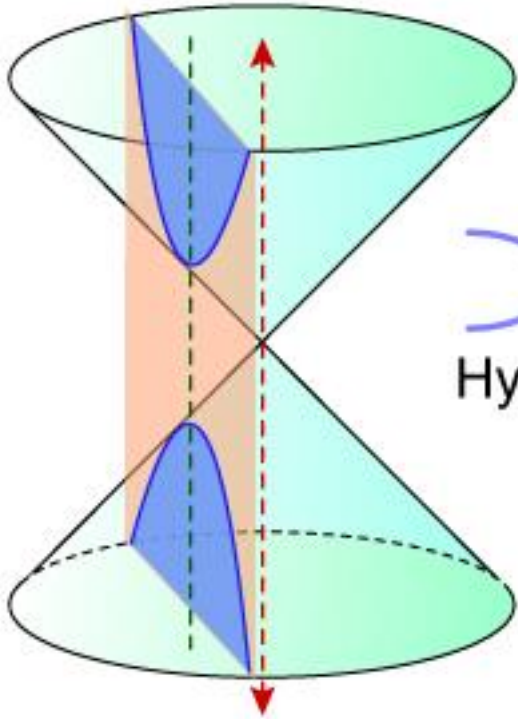
$$1 - e^2 = e^2$$

$$1 = 2e^2$$

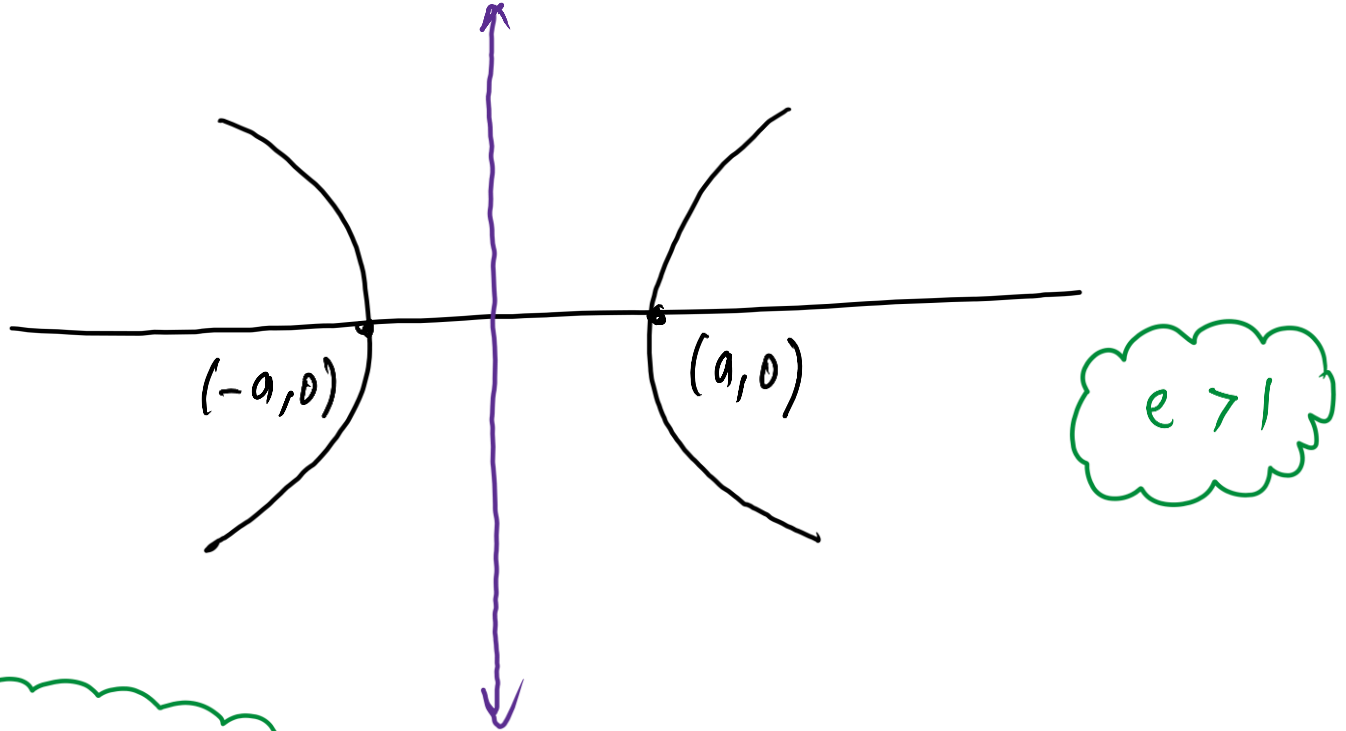
$$e^2 = \frac{1}{2}$$

$$e = \frac{1}{\sqrt{2}}$$

HYPERBOLA



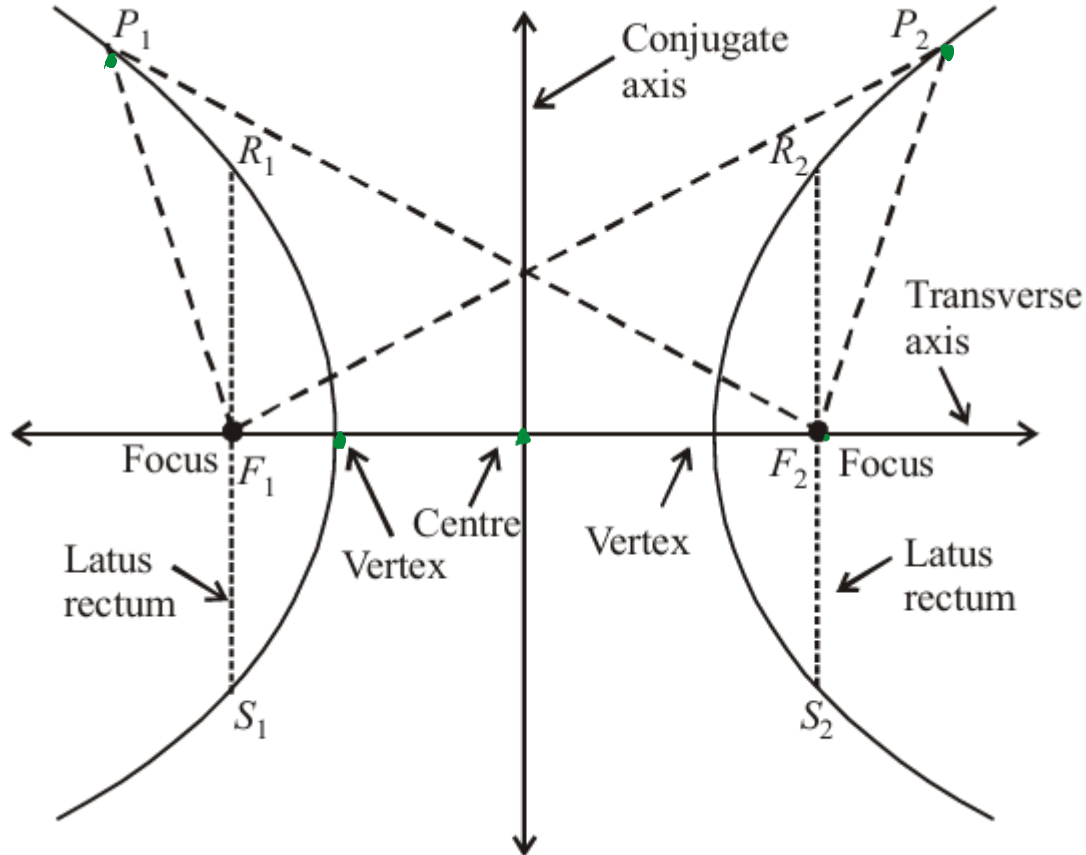
Hyperbola



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

$2a =$ transverse axis length
 $2b =$ conjugate axis length

HYPERBOLA

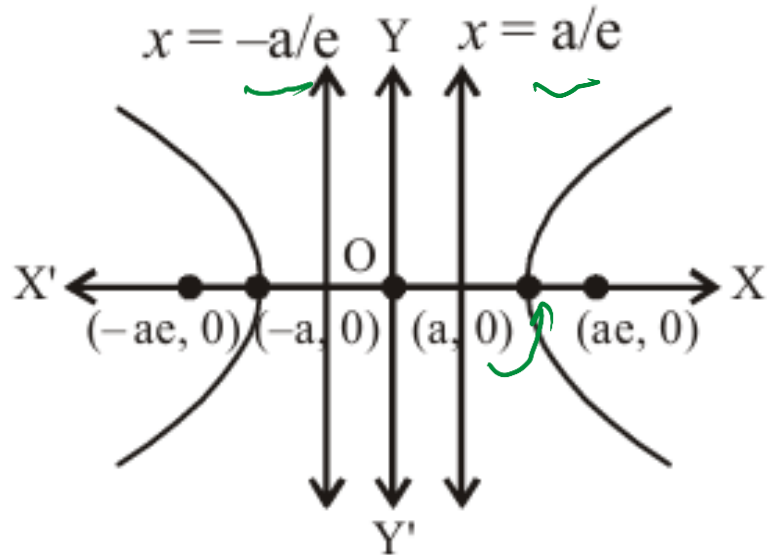


$$P_1 F_2 - P_2 F_1 = 2a$$

(Length of
conjugate axis)

$$P_2 F_1 - P_2 F_2 = 2a$$

HYPERBOLA



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

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

centre $\rightarrow (0,0)$

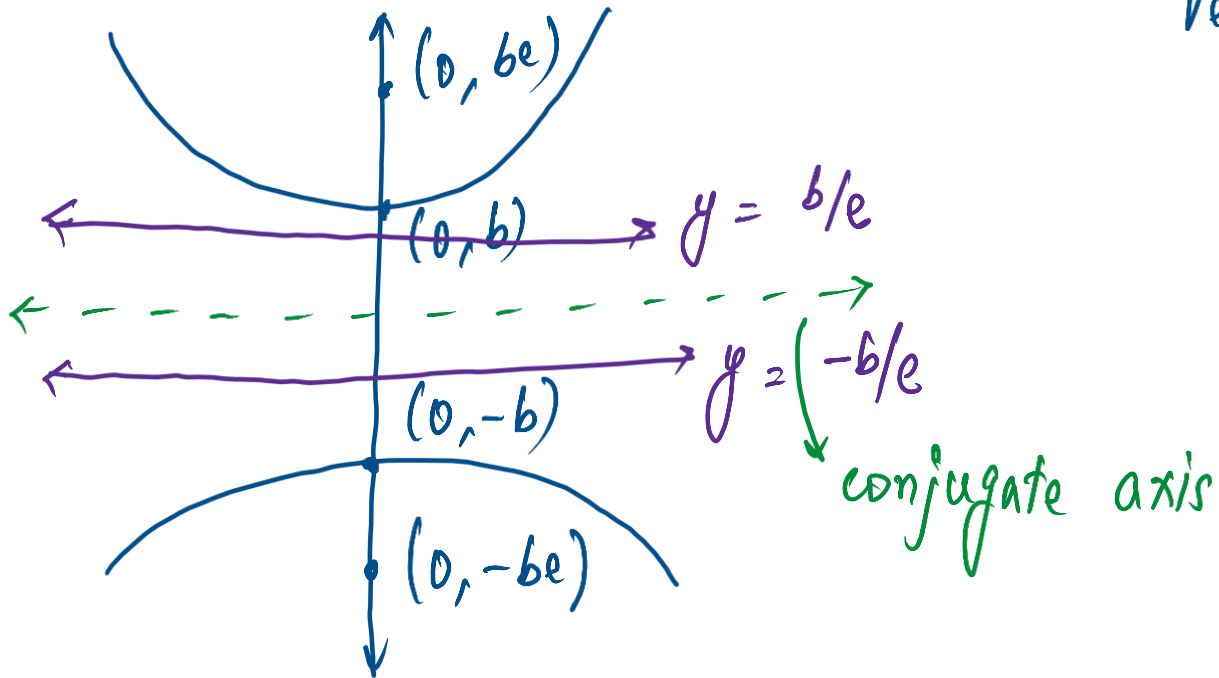
vertices $\rightarrow (\pm a, 0)$

focus $\rightarrow (\pm ae, 0)$

directrix $\rightarrow x = \pm \frac{a}{e}$

Latus rectum $\rightarrow \frac{2b^2}{a}$

HYPERBOLA



Vertices $\rightarrow (0, \pm b)$

Foci $\rightarrow (0, \pm be)$

Directrices $\rightarrow y = \pm \frac{b}{e}$

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

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

Equation of the hyperbola with eccentricity $\frac{3}{2}$ and foci at

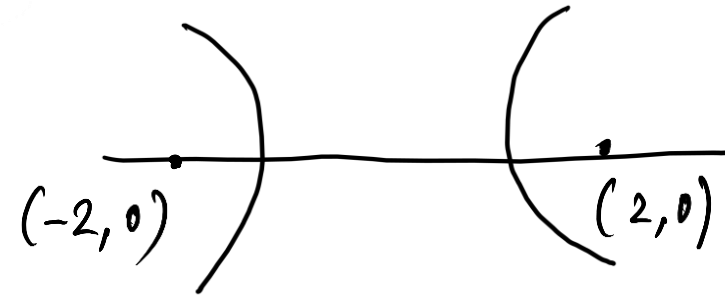
$(\pm 2, 0)$ is

(a) $\frac{x^2}{4} - \frac{y^2}{5} = \frac{4}{9}$ ✓

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

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

(d) None of these



$$ae = 2$$

$$a\left(\frac{3}{2}\right) = 2$$

$$a = \frac{4}{3} \quad \left. \vphantom{a = \frac{4}{3}} \right\} a^2 = \frac{16}{9}$$

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

$$\frac{9}{4} = 1 + \frac{b^2}{\left(\frac{16}{9}\right)}$$

$$\frac{9}{4} \times \frac{16}{9} = 16 + 9b^2$$

$$36 - 16 = 9b^2$$

$$\frac{20}{9} = b^2$$

$$\frac{x^2}{16} - \frac{y^2}{20} = 1$$

$$\frac{x^2}{16} - \frac{y^2}{20} = \frac{1}{9}$$

$$\frac{x^2}{4} - \frac{y^2}{5} = \frac{4}{9}$$

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