

# Plane Geometry

## Hyperbola

### Important Questions (PYQ)

Find the e.c. of directrix, Centre, foci of hyperbola

$$16x^2 - 9y^2 - 32x + 36y - 164 = 0$$

$$16x^2 - 9y^2 - 32x + 36y - 164 = 0$$

$$16x^2 - 32x - 9y^2 + 36y = 164$$

$$16(x^2 - 2x) - 9(y^2 - 4y) = 164$$

Sol.  
=

$$16(x^2 - 2x + 1) - 9(y^2 - 4y + 4) = 164 + 16 - 36$$

$$16(x-1)^2 - 9(y-2)^2 = 144$$

$$\frac{16(x-1)^2}{144} - \frac{9(y-2)^2}{144} = 1$$

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

$$\text{Let } x-1 = X$$

$$y-2 = Y$$

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

$$a^2 = 9$$

$$b^2 = 16$$

$$a = 3$$

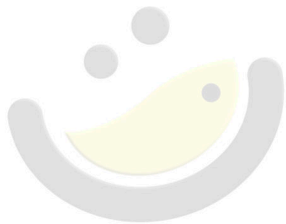
$$b = 4$$

$$e = ?$$

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

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

$$\frac{16}{9} + 1 = e^2$$



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$$\frac{25}{9} = e^2$$

$$e = 5/3$$

Centre (0,0)

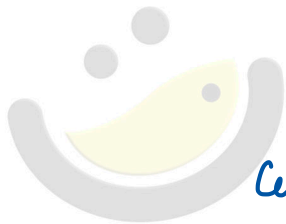
$$x = 0 \quad y = 0$$

$$x - 1 = 0 \quad y - 2 = 0$$

$$x = 1$$

$$y = 2$$

Centre of given hyperbola is (1,2)



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Directrix

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

$$x - 1 = \pm \frac{3}{5/3}$$

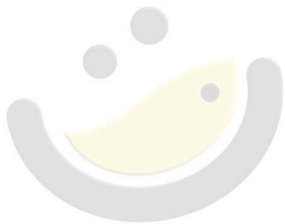
$$x - 1 = \pm \frac{9}{5}$$

$$x - 1 = \frac{9}{5}$$

$$5x - 5 = 9$$
$$5x = 14$$

or  $x - 1 = -\frac{9}{5}$

$$5x - 5 = -9$$
$$5x = -4$$



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$$x = 14/5$$

$$x = -4/5$$

focus

$$(\pm ae, 0)$$

$$X = \pm ae \quad Y = 0$$

$$x - 1 = \pm 3 \cdot \frac{5}{3} \quad y - 2 = 0$$

$$x - 1 = 5 \quad \text{or} \quad x - 1 = -5 \quad y = 2$$

$$x = 6 \quad , \quad x = -4$$

focus  $F_1 = (6, 2) \quad F_2 = (-4, 2)$

ex. of transverse axis

$$y = 0$$

$$y - 2 = 0$$

$$y = 2$$

ex. of conjugate axis.

$$x = 0$$

$$x - 1 = 0$$

$$x = 1$$



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eq of Latus Rectum

$$X = \pm ae$$

$$X = \pm 3 \cdot \frac{5}{3}$$

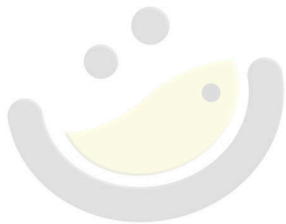
$$x - 1 = \pm 5$$

$$x - 1 = 5$$

$$x = 6$$

$$\text{or } x - 1 = -5$$

$$x = -4$$



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