

# Assignment No.5

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Download latex-tikz codes from

<https://github.com/sravani706/Assignment5/main/main.tex>

Download python codes from

<https://github.com/sravani706/Assignment5/main/main.tex>

Question taken from

Quadratic\_forms, exercise 2

Replacing  $x$  by  $\begin{pmatrix} x \\ y \end{pmatrix}$  in (2.0.2)

$$\frac{\mathbf{x}^2}{\frac{9}{8}} + \frac{\mathbf{y}^2}{\frac{9}{8}} + \frac{2}{3}\mathbf{y} = 1 \quad (2.0.4)$$

$$\frac{8}{9}\mathbf{x}^2 + \frac{8}{9}\mathbf{y}^2 + \frac{2}{3}\mathbf{y} = 1 \quad (2.0.5)$$

$$8\mathbf{x}^2 + 8\mathbf{y}^2 + 6\mathbf{y} = 9 \quad (2.0.6)$$

$$(2.0.7)$$

$\therefore$  this is the equation of hyperbola

## 1 QUESTION No 2.30

Find the equation of the hyperbola with vertices  $\begin{pmatrix} 0 \\ \pm \frac{\sqrt{11}}{2} \end{pmatrix}$  and foci are  $\begin{pmatrix} 0 \\ \pm 3 \end{pmatrix}$

## 2 SOLUTION

We have been provided with values for vertices and foci

The given vertices are-  $\begin{pmatrix} 0 \\ \pm \frac{\sqrt{11}}{2} \end{pmatrix}$

The given vertices are in the form of  $\begin{pmatrix} 0 \\ \pm 3 \end{pmatrix}$  Here,

The major axis is along X axis

The equation of conic is given as

$$\mathbf{x}^T(\mathbf{t}^T - \mathbf{n}\mathbf{n}^T)\mathbf{x} + 2(\mathbf{c}\mathbf{n} - \mathbf{t}\mathbf{f}^T\mathbf{x} + \mathbf{t}\|\mathbf{F}\|^2 - \mathbf{c}^2 = 0$$

Thus,

$$\mathbf{F} = \begin{pmatrix} 0 \\ \pm 3 \end{pmatrix}, \mathbf{n} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \mathbf{c} = 0, \mathbf{t} = \frac{1}{9} \quad (2.0.1)$$

$$\mathbf{n}^T \left( \frac{1}{9} \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} - \begin{pmatrix} 0 \\ 1 \end{pmatrix} \begin{pmatrix} 0 & 1 \end{pmatrix} \right) \mathbf{x} + 2 \left( 0 - \frac{1}{9} \begin{pmatrix} 0 \\ \pm 3 \end{pmatrix} \right)^T \mathbf{x} + \frac{1}{9} \left\| \begin{pmatrix} 0 \\ \pm 3 \end{pmatrix} \right\|^2 - 0 = 0 \quad (2.0.2)$$

$$\mathbf{x}^T \left( \begin{pmatrix} -\frac{8}{9} & 0 \\ 0 & -\frac{8}{9} \end{pmatrix} \right) \mathbf{x} + 2 \left( 0 \frac{1}{3} \right) \mathbf{x} + 1 = 0 \quad (2.0.3)$$

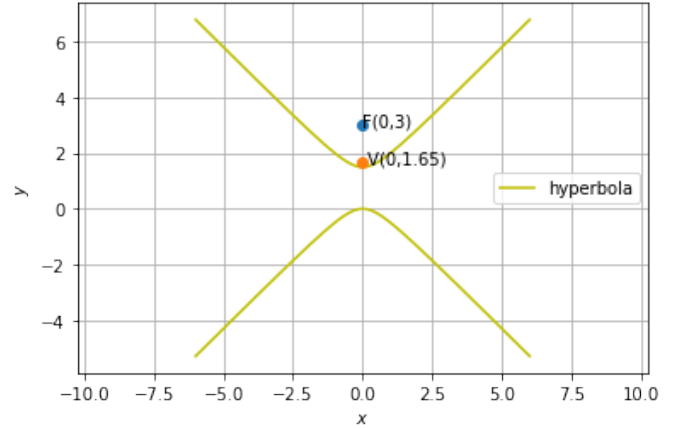


Fig. 0: Hyperbola