Assignment No.5

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Download latex-tikz codes from

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

Download python codes from

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Question taken from

Quadratic_forms, exercise 2

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 hyperbola is

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

Thus, based on the values of vertices and equation form

$$\mathbf{a} = \frac{\sqrt{11}}{2} \tag{2.0.1}$$

$$\mathbf{a^2} = \frac{11}{2} \tag{2.0.2}$$

Also, The giver coordinate of foci are $\begin{pmatrix} 0 \\ \pm 3 \end{pmatrix}$ We know that foci= $\begin{pmatrix} 0 \\ \pm c \end{pmatrix}$

$$Thus\ \mathbf{C} = 3 \tag{2.0.3}$$

We know that,

$$\mathbf{c^2} = \mathbf{a^2} + \mathbf{b^2} \tag{2.0.4}$$

$$3^2 = \frac{11}{4} + \mathbf{b^2} \tag{2.0.5}$$

$$\mathbf{b^2} = \frac{11}{4} - 3^2 \tag{2.0.6}$$

$$\mathbf{b^2} = \frac{36 - 11}{4} \tag{2.0.7}$$

$$\mathbf{b^2} = \frac{25}{4} \tag{2.0.8}$$

The equation of hyperbola is-

$$\frac{\mathbf{y^2}}{\mathbf{a^2}} - \frac{\mathbf{x^2}}{\mathbf{b^2}} = 1 \tag{2.0.9}$$

substitute the values to get equation for hyperbola-

$$\frac{\mathbf{y^2}}{\frac{11}{4}} + \frac{\mathbf{x^2}}{\frac{25}{4}} = 1 \tag{2.0.10}$$

$$100\mathbf{y^2} - 44\mathbf{x^2} = 275 \tag{2.0.11}$$

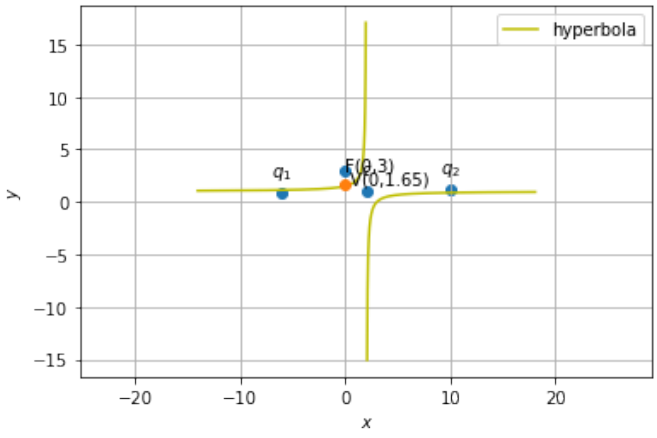

Fig. 0: Hyperbola