

# ASSIGNMENT 5

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Download all python codes from

[https://github.com/BatharajuRamana/Assignment\\_6/blob/main/assignment6.py](https://github.com/BatharajuRamana/Assignment_6/blob/main/assignment6.py)

and latex-tikz codes from

[https://github.com/BatharajuRamana/Assignment\\_6/blob/main/Assignment6/main.tex](https://github.com/BatharajuRamana/Assignment_6/blob/main/Assignment6/main.tex)

Putting (2.0.5) and (2.0.6) in (2.0.1), we get

$$\Rightarrow \mathbf{x}^T \begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{25} \end{pmatrix} \mathbf{x} = 1 \quad (2.0.7)$$

The Plot of ellipse is:

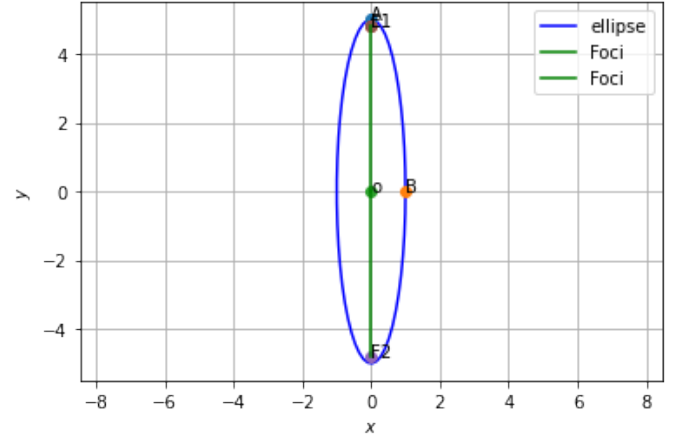


Fig. 2.1: Ellipse  $\frac{x^2}{1} + \frac{y^2}{25} = 1$

## 1 QUESTION No 2.72(E)

Find the equation for the ellipse that satisfies the given conditions: Ends of major axis  $\begin{pmatrix} 0 \\ \pm 5 \end{pmatrix}$ , ends of minor axis  $\begin{pmatrix} \pm 1 \\ 0 \end{pmatrix}$

## 2 SOLUTION

**Lemma 2.1.** The standard equation of an ellipse is given by:

$$\frac{\mathbf{x}^T D \mathbf{x}}{\mathbf{u}^T \mathbf{V}^{-1} \mathbf{u} - f} = 1 \quad (2.0.1)$$

$$\text{where, } D = \begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix} \quad (2.0.2)$$

Also, the length of semi major axis along y axis is

$$a = \sqrt{\frac{\mathbf{u}^T \mathbf{V}^{-1} \mathbf{u} - f}{\lambda_2}} \quad (2.0.3)$$

and the length of semi minor axis along x axis is

$$b = \sqrt{\frac{\mathbf{u}^T \mathbf{V}^{-1} \mathbf{u} - f}{\lambda_1}} \quad (2.0.4)$$

For major axis  $a = 5$  substitute in (2.0.3)

$$\lambda_2 = \frac{\mathbf{u}^T \mathbf{V}^{-1} \mathbf{u} - f}{25} \quad (2.0.5)$$

For minor axis  $b = 1$  substitute in (2.0.4)

$$\lambda_1 = \frac{\mathbf{u}^T \mathbf{V}^{-1} \mathbf{u} - f}{1} \quad (2.0.6)$$