ASSIGNMENT-6

SOWMYA BANDI

Download all python codes from

https://github.com/Sowmyabandi99/Assignment_6/blob/main/assignment6.py

and latex-tikz codes from

https://github.com/Sowmyabandi99/Assignment_6/blob/main/Assignment6/main.tex

1 Question No 2.74(h)

Find the equation for the ellipse that satisfies the given conditions:

Ends of major axis $\begin{pmatrix}0\\ \pm5\end{pmatrix}$, ends of minor axis $\begin{pmatrix}\pm1\\ 0\end{pmatrix}$

2 Solution

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

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

$$where, D=\begin{pmatrix}\lambda_1 & 0\\ 0 & \lambda_2\end{pmatrix} \tag{2.0.2}$$

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

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

and the length of semi minor axis along x axis is

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

For major axis a = 5 substitute in (2.0.3)

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

For minor axis b = 1 substitute in (2.0.4)

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

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

$$\implies \mathbf{x}^T\begin{pmatrix}1 & 0\\ 0 & \frac{1}{25}\end{pmatrix}\mathbf{x}=1 \tag{2.0.7}$$

The Plot of ellipse is:

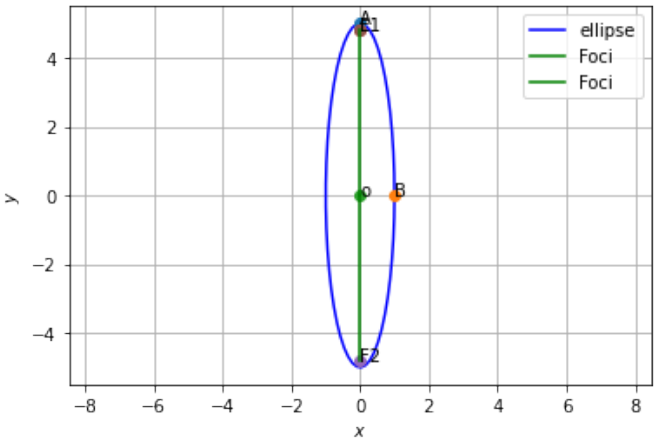

Fig. 2.1: Ellipse $\frac{x^2}{1}+\frac{y^2}{25}=1$