

9-9.2-5

EE24BTECH11036 - Krishna Patil

Question:

Find the area of the region bounded by the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$.

Solution:

Equation of a conic in matrix form is :

$$x^T V x + 2u^T x + f = 0 \quad (1)$$

For given ellipse,

$$V = \begin{pmatrix} \frac{4}{9} & 0 \\ 0 & 1 \end{pmatrix} \quad (2)$$

$$u = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (3)$$

$$f = -1 \quad (4)$$

\therefore Area of the ellipse is

$$A = 4 \int_0^2 3 \sqrt{1 - \frac{x^2}{4}} dx \quad (5)$$

$$A = 6\pi \quad (6)$$

Parameter	Description	Values
V	$\begin{pmatrix} 1 - e^2 & 0 \\ 0 & 1 \end{pmatrix}$	$\begin{pmatrix} \frac{4}{9} & 0 \\ 0 & 1 \end{pmatrix}$
A	Area under Curve	6π

TABLE I: Parameters Used

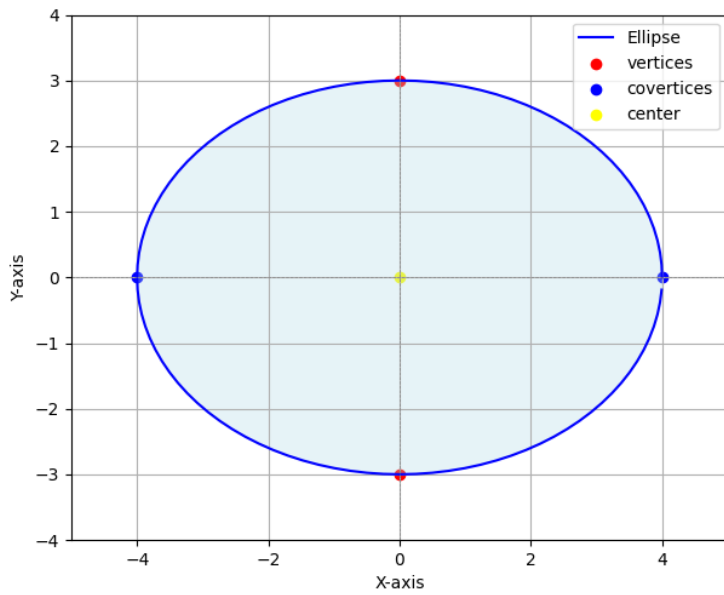


Fig. 1: Plot of ellipse