

9-9.2-13

AI24BTECH11016 - Jakkula Adishesh Balaji

INTERSECTION OF CONICS(CHORDS)

Question:

9.2.13 Find the area of the region bounded by the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$
Equation of curve in Matrix form is

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

For the given ellipse, The values of \vec{V}, \vec{u}, f are

$$\vec{V} = \begin{pmatrix} 9 & 0 \\ 0 & 16 \end{pmatrix} \quad (2)$$

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

$$f = -144 \quad (4)$$

The area under the curve is given by

$$A = 4 \int_0^4 3 \sqrt{1 - \frac{x^2}{16}} dx \quad (5)$$

$$A = 12\pi \quad (6)$$

Parameter	Description	Values
V	$ \vec{n}^2 - e^2 \vec{n} \vec{n}^T$	$\begin{pmatrix} 9 & 0 \\ 0 & 16 \end{pmatrix}$
u	$c e^2 \vec{n} - \vec{n}^2 \vec{F}^T$	$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$
A	Area under Curve	12π
f	$ \vec{n}^2 \vec{F}^2 - c^2 e^2$	-144

TABLE .I
PARAMETERS USED

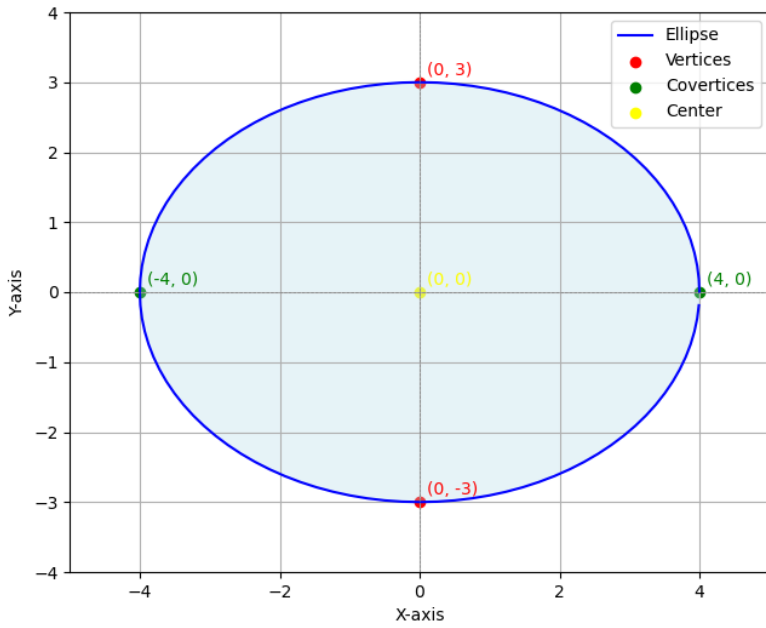


Fig. .1. Plot of ellipse