7-7.2-19

AI24BTECH11020 - RISHIKA KOTHA

Question:Equation of the circle with centre on the Y axis and passing through the origin and the point (2, 3) is
a)$3x^2 + 3y^2 - 13y = 0$
b)$3x^2 + 3y^2 + 13x + 3 = 0$
c)$6x^2 + 6y^2 - 13x = 0$
d)$x^2 + y^2 + 13x + 3 = 0$
Solution: from the given information,

$$x_1 = \begin{pmatrix}2\\3\end{pmatrix}, x_2 = \begin{pmatrix}0\\0\end{pmatrix}, n = \begin{pmatrix}1\\0\end{pmatrix}, c = 0 \tag{0.1}$$

$$\begin{pmatrix}4 & 6 & 1\\0 & 0 & 1\\-1 & 0 & 0\end{pmatrix}\begin{pmatrix}u\\f\end{pmatrix} = \begin{pmatrix}-13\\0\\0\end{pmatrix} \tag{0.2}$$

The augmented matrix is expressed as

$$\left(\begin{array}{ccc|c}4 & 6 & 1 & -13\\0 & 0 & 1 & 0\\-1 & 0 & 0 & 0\end{array}\right) \tag{0.3}$$

$$\xleftrightarrow{R_3\to 4R_3+R_1}\left(\begin{array}{ccc|c}4 & 6 & 1 & -13\\0 & 0 & 1 & 0\\0 & 6 & 1 & -13\end{array}\right)\xleftrightarrow{R_1\to R_1-R_3}\left(\begin{array}{ccc|c}4 & 0 & 0 & 0\\0 & 0 & 1 & 0\\0 & 6 & 1 & -13\end{array}\right)$$

$$\xleftrightarrow{R_2\to R_2-R_3}\left(\begin{array}{ccc|c}4 & 0 & 0 & 0\\0 & -6 & 0 & 13\\0 & 6 & 1 & -13\end{array}\right)\xleftrightarrow{R_3\to R_3+R_2}\left(\begin{array}{ccc|c}4 & 0 & 0 & 0\\0 & -6 & 0 & 13\\0 & 0 & 1 & 0\end{array}\right)$$

$$\xleftrightarrow{R_1\to R_1/4, R_2\to R_2/-6}\left(\begin{array}{ccc|c}1 & 0 & 0 & 0\\0 & 1 & 0 & -13/6\\0 & 0 & 1 & 0\end{array}\right)$$

$$sou = \begin{pmatrix}0\\-13/6\end{pmatrix}, f = 0 \tag{0.4}$$

$\therefore$ the equation of the circle is $3x^2 + 3y^2 - 13y = 0$.

parameter	value
centre(C)	$\begin{pmatrix} 0 \\ 13/6 \end{pmatrix}$
Origin(O)	$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$
point(P)	$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$
radius(r)	13/6