

EE1390

Matrix Project

EE18BTECH11027 and EE18BTECH11011

Find the equation of the tangent to the circle, at the point $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$ whose centre is the point of intersection of the straight lines

$$(2 \ 1)\mathbf{x} - 3 = 0$$

$$(1 \ -1)\mathbf{x} - 1 = 0$$

Given the equations of two lines:

$$(2 \ 1)\mathbf{x} - 3 = 0$$

$$(1 \ -1)\mathbf{x} - 1 = 0$$

Solving these two equations , we get the point of intersection as I, which is the centre of the circle.

$$\begin{pmatrix} 2 & 1 \\ 1 & -1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

$$\mathbf{x} = \begin{pmatrix} 1/3 & 1/3 \\ 1/3 & -2/3 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

$$\mathbf{x} = \begin{pmatrix} 4/3 \\ 1/3 \end{pmatrix}$$

So coordinates of P in matrix form are $\begin{pmatrix} 4/3 \\ 1/3 \end{pmatrix}$

The radius of the circle is given by norm of $\begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} 4/3 \\ 1/3 \end{pmatrix}$ which gives radius equal to $\sqrt{17/9}$.

now we find the tangent to the circle.

The direction vector of tangent is given by- $\begin{pmatrix} 1/3 & 1/3 \\ 1/3 & -2/3 \end{pmatrix} \begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} 4/3 \\ 1/3 \end{pmatrix}$ which simplifies to $\begin{pmatrix} -4/3 \\ 1/3 \end{pmatrix}$

Equation of tangent is given by- $\begin{pmatrix} 1 \\ 4 \end{pmatrix} \cdot \mathbf{x} = -3$

