

Assignment 1

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- 1) Find the equation of a circle with centre (2, 2) and passes through the point (4, 5).

Hence the equation of circles is given by,

$$\|\mathbf{x}\|^2 + 2 \begin{pmatrix} -2 & -2 \end{pmatrix} \mathbf{x} - 5 = 0 \quad (0.0.8)$$

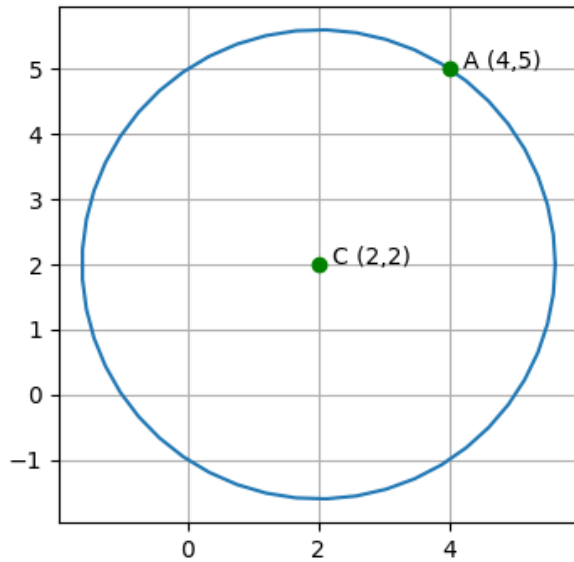


Fig. 1: Graph

Solution: We know that the equation to the circle is given as

$$\|\mathbf{x}\|^2 + 2\mathbf{u}^T \mathbf{x} + f = 0 \quad (0.0.1)$$

Given the centre is (2, 2) and a point (4, 5) lies on circle

$$\mathbf{u} = -\begin{pmatrix} 2 \\ 2 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 4 \\ 5 \end{pmatrix} \quad (0.0.2)$$

$$\|\mathbf{A}\|^2 + 2\mathbf{u}^T \mathbf{A} + f = 0 \quad (0.0.3)$$

$$f = -\|\mathbf{A}\|^2 - 2\mathbf{u}^T \mathbf{A} \quad (0.0.4)$$

$$f = -(4^2 + 5^2) - 2 \begin{pmatrix} -2 & -2 \end{pmatrix} \begin{pmatrix} 4 \\ 5 \end{pmatrix} \quad (0.0.5)$$

$$f = -41 - 2(-18) \quad (0.0.6)$$

$$f = -5 \quad (0.0.7)$$