

2.2.17

AI25BTECH11024 - Pratyush Panda

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Question:

Find the angle between the lines:

$$y = (2 - \sqrt{3})(x + 5) \text{ and} \quad (0.1)$$

$$y = (2 + \sqrt{3})(x - 7). \quad (0.2)$$

Solution:

The given equations can be written as;

$$(2 - \sqrt{3})x - y = (\sqrt{3} - 2)5 \quad (0.3)$$

$$(2 + \sqrt{3})x - y = (2 + \sqrt{3})7 \quad (0.4)$$

From this, we can see that the normal vectors of the lines can be expressed as,

$$\mathbf{n}_1 = \begin{pmatrix} 2 - \sqrt{3} \\ -1 \end{pmatrix}, \mathbf{n}_2 = \begin{pmatrix} 2 + \sqrt{3} \\ -1 \end{pmatrix} \quad (0.5)$$

The angle between the lines can be obtained as;

$$\cos \theta = \frac{\mathbf{n}_1^T \mathbf{n}_2}{\|\mathbf{n}_1\| \|\mathbf{n}_2\|} = \frac{1}{2} \quad (0.6)$$

$$\text{or, } \theta = 60^\circ \quad (0.7)$$

