1.7.10

AI25BTECH11024 - Pratyush Panda

Question:
Find the angle between the lines:

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

$$y = \left(2 + \sqrt{3}\right)(x - 7)\,. \tag{0.2}$$

Solution:
The given equations can be written as;

$$\left(2 - \sqrt{3}\right)x - y = \left(\sqrt{3} - 2\right)5 \tag{0.3}$$

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

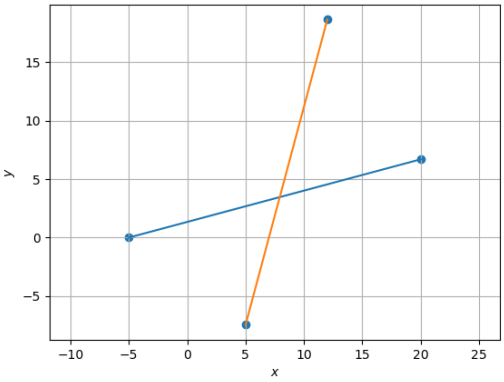
From this, we can see that the normal vectors of the lines can be expressed as,

$$\mathbf{n_1} = \begin{pmatrix} 2 - \sqrt{3} \\ -1 \end{pmatrix}, \mathbf{n_2} = \begin{pmatrix} 2 + \sqrt{3} \\ -1 \end{pmatrix} \tag{0.5}$$

The angle between the lines can be obtained as;

$$\cos\theta = \frac{n_1^T n_2}{\|n_1\|\,\|n_2\|} = \frac{1}{2} \tag{0.6}$$

$$or,\ \theta = 60^\circ \tag{0.7}$$


15
10
5
0
−5
y
−10
−5
0
5
10
15
20
25
x