Assignment No.2

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Download all python codes from

https://github.com/Sekharjala/Assignments/blob/main/code

and pdf from

https://github.com/Sekharjala/Assignments/blob/main/Assignment2.pdf

1 LINEAR FORMS Q.No : 2.22

Question : Find the angle between the following pair of lines:

$$L_1 : \quad \mathbf{x} = \begin{pmatrix} 3 \\ 1 \\ -2 \end{pmatrix} + \lambda_1 \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix} \tag{1.0.1}$$

$$L_2 : \quad \mathbf{x} = \begin{pmatrix} 2 \\ -1 \\ -56 \end{pmatrix} + \lambda_2 \begin{pmatrix} 3 \\ -5 \\ -4 \end{pmatrix} \tag{1.0.2}$$

2 SOLUTION

From (1.0.1) and (1.0.2) we get the directional vector of L_1 is $\mathbf{a}$ and L_2 is $\mathbf{b}$ respectively

$$\mathbf{a} = \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix} \tag{2.0.1}$$

$$\mathbf{b} = \begin{pmatrix} 3 \\ -5 \\ -4 \end{pmatrix} \tag{2.0.2}$$

angle Between the pair of lines is calculated by using cosine formula

$$\cos\theta = \frac{\mathbf{a}^T\mathbf{b}}{\|\mathbf{a}\|\|\mathbf{b}\|} \tag{2.0.3}$$

$$\mathbf{a}^T\mathbf{b} = \begin{pmatrix} 1 & -1 & -2 \end{pmatrix} \begin{pmatrix} 3 \\ -5 \\ -4 \end{pmatrix} = 3 + 5 + 8 = 16 \tag{2.0.4}$$

$$\|\mathbf{a}\| = \sqrt{1^2 + (-1)^2 + (-2)^2} = \sqrt{6} \tag{2.0.5}$$

$$\|\mathbf{b}\| = \sqrt{(3)^2 + (-5)^2 + (-4)^2} = \sqrt{50} \tag{2.0.6}$$

from above equations (2.0.4) (2.0.5) and (2.0.6) we get

$$\cos\theta = \frac{16}{\sqrt{6}\sqrt{50}} \tag{2.0.7}$$

$$\theta = \arccos\frac{16}{\sqrt{6}\sqrt{50}} = 22.5178253587^\circ \tag{2.0.8}$$

The angle between the line is 22.5178253587 °

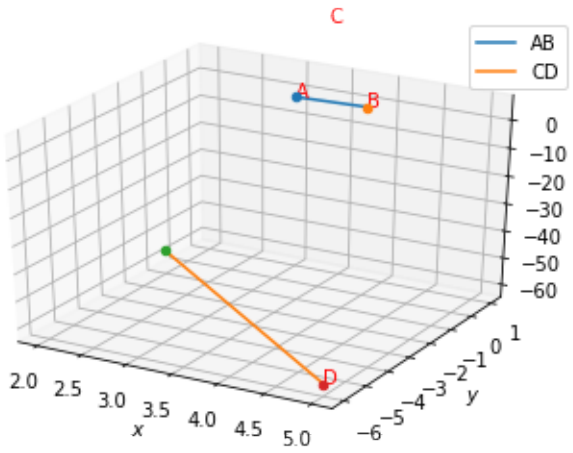

Fig. 0: L1 and L2 are two Lines formed by (1.0.1) and (1.0.2)