

# Assignment 2

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Download all python codes from

<https://github.com/sachinombdubey/Matrix-theory/Assignment2/codes>

and latex-tikz codes from

<https://github.com/sachinombdubey/Matrix-theory/Assignment2>

Q no. 73. Find the angle between the following pair of lines:

1)

$$L_1 : \mathbf{x} = \begin{pmatrix} 2 \\ -5 \\ 1 \end{pmatrix} + \lambda_1 \begin{pmatrix} 3 \\ 2 \\ 6 \end{pmatrix} \quad (0.0.1)$$

$$L_2 : \mathbf{x} = \begin{pmatrix} 7 \\ -6 \\ 0 \end{pmatrix} + \lambda_2 \begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix} \quad (0.0.2)$$

2)

$$L_1 : \mathbf{x} = \begin{pmatrix} 3 \\ 1 \\ -2 \end{pmatrix} + \lambda_1 \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix} \quad (0.0.3)$$

$$L_2 : \mathbf{x} = \begin{pmatrix} 2 \\ -1 \\ -56 \end{pmatrix} + \lambda_2 \begin{pmatrix} 3 \\ -5 \\ -4 \end{pmatrix} \quad (0.0.4)$$

**Solution:**

1) The direction vectors of the lines are  $\begin{pmatrix} 3 \\ 2 \\ 6 \end{pmatrix}$  and

$$\begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix}.$$

Thus, the angle  $\theta$  between two vectors is given by

$$\cos \theta = \frac{\mathbf{a}^T \mathbf{b}}{\|\mathbf{a}\| \|\mathbf{b}\|} \quad (0.0.5)$$

$$= \frac{19}{3 \times 7} \quad (0.0.6)$$

$$\Rightarrow \theta = 25.21^\circ \quad (0.0.7)$$

2) The direction vectors of the lines are  $\begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix}$  and  $\begin{pmatrix} 3 \\ -5 \\ -4 \end{pmatrix}.$

Thus, the angle  $\theta$  between two vectors is given by

$$\cos \theta = \frac{\mathbf{a}^T \mathbf{b}}{\|\mathbf{a}\| \|\mathbf{b}\|} \quad (0.0.8)$$

$$= \frac{16}{\sqrt{6} \times \sqrt{50}} \quad (0.0.9)$$

$$\Rightarrow \theta = 22.52^\circ \quad (0.0.10)$$