

# Assignment 4

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Download all python codes from

<https://github.com/SavaranaDatta/EE3900/tree/main/Assignment4/codes/Assingment4.py>

and latex codes from

<https://github.com/SavaranaDatta/EE3900/tree/main/Assignment4/Assignment4.tex>

$$\|\mathbf{a}\| = \sqrt{38} \quad (2.0.6)$$

$$\|\mathbf{b}\| = 9 \quad (2.0.7)$$

$$\Rightarrow \cos \theta = \frac{26}{9\sqrt{38}} \quad (2.0.8)$$

$$\theta = \cos^{-1}\left(\frac{26}{9\sqrt{38}}\right) \quad (2.0.9)$$

$$= 62.053^\circ \quad (2.0.10)$$

## 1 LINEAR FORMS 2.88

Find the angle between the following pair of lines

a)

$$\frac{x-2}{2} = \frac{y-1}{5} = \frac{z+3}{-3} \quad (1.0.1)$$

$$\frac{x+2}{-1} = \frac{y-4}{8} = \frac{z-5}{4} \quad (1.0.2)$$

b)

$$\frac{x}{2} = \frac{y}{2} = \frac{z}{1} \quad (1.0.3)$$

$$\frac{x-5}{4} = \frac{y-4}{1} = \frac{z-3}{8} \quad (1.0.4)$$

## 2 SOLUTION(LINEAR FORMS 2.88)

1) The direction vectors  $\mathbf{a}$  and  $\mathbf{b}$  of the two lines are

$$\mathbf{a} = \begin{pmatrix} 2 \\ 5 \\ -3 \end{pmatrix} \quad (2.0.1)$$

$$\mathbf{b} = \begin{pmatrix} -1 \\ 8 \\ 4 \end{pmatrix} \quad (2.0.2)$$

Let  $\theta$  be the angle between the vectors,

$$\cos \theta = \frac{\mathbf{a}^T \mathbf{b}}{\|\mathbf{a}\| \|\mathbf{b}\|} \quad (2.0.3)$$

$$\mathbf{a}^T \mathbf{b} = \begin{pmatrix} 2 & 5 & -3 \end{pmatrix} \begin{pmatrix} -1 \\ 8 \\ 4 \end{pmatrix} \quad (2.0.4)$$

$$= 26 \quad (2.0.5)$$

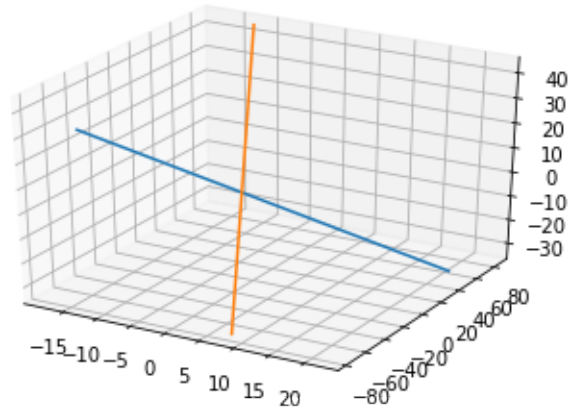


Fig. 1: The plot of the lines

2) The direction vectors  $\mathbf{a}$  and  $\mathbf{b}$  of the two lines are

$$\mathbf{c} = \begin{pmatrix} 2 \\ 2 \\ 1 \end{pmatrix} \quad (2.0.11)$$

$$\mathbf{d} = \begin{pmatrix} 4 \\ 1 \\ 8 \end{pmatrix} \quad (2.0.12)$$

Let  $\theta$  be the angle between the vectors,

$$\cos \theta = \frac{\mathbf{c}^T \mathbf{d}}{\|\mathbf{c}\| \|\mathbf{d}\|} \quad (2.0.13)$$

$$\mathbf{c}^\top \mathbf{d} = \begin{pmatrix} 2 & 2 & 1 \end{pmatrix} \begin{pmatrix} 4 \\ 1 \\ 8 \end{pmatrix} \quad (2.0.14)$$

$$= 18 \quad (2.0.15)$$

$$\|\mathbf{c}\| = 3 \quad (2.0.16)$$

$$\|\mathbf{d}\| = 9 \quad (2.0.17)$$

$$\Rightarrow \cos \theta = \frac{18}{9 \times 3} \quad (2.0.18)$$

$$\theta = \cos^{-1} \left( \frac{2}{3} \right) \quad (2.0.19)$$

$$= 48.189^\circ \quad (2.0.20)$$

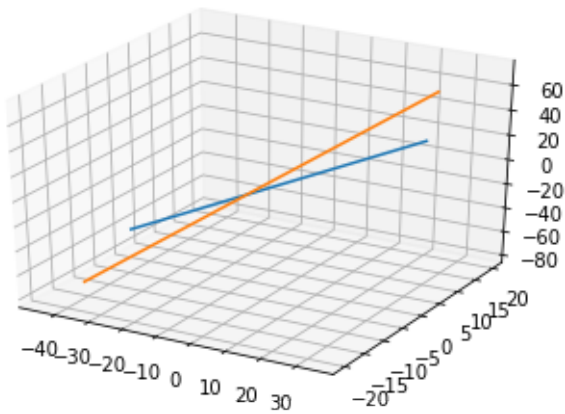


Fig. 2: The plot the lines