## AI1110 Assignment 1

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## ICSE class 12 paper 2019 Q15 (c)

Find the angle between the two lines 2x = 3y = -zand 6x = -y = -4z.

## **Solution:**

The two lines can be expressed in vector form as

$$\mathbf{r} = \lambda \begin{pmatrix} 3 \\ 2 \\ -6 \end{pmatrix}$$

$$\mathbf{r} = \mu \begin{pmatrix} 2 \\ -12 \\ -3 \end{pmatrix}$$
(2)

$$\mathbf{r} = \mu \begin{pmatrix} 2 \\ -12 \\ -3 \end{pmatrix} \tag{2}$$

The angle between the two lines is given by

$$\theta = \arccos\left(\frac{\mathbf{m}^{\mathsf{T}}\mathbf{n}}{\|\mathbf{m}\| \|\mathbf{n}\|}\right) \tag{5}$$

as
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as
$$(1) \qquad \Rightarrow \theta = \arccos\left(\frac{\left(3 \quad 2 \quad -6\right)^{\top} \begin{pmatrix} 2 \\ -12 \\ -3 \end{pmatrix}}{\|\begin{pmatrix} 3 \\ 2 \\ -6 \end{pmatrix}\| \|\begin{pmatrix} 2 \\ -12 \\ -3 \end{pmatrix}\|}\right) \tag{6}$$

$$(2) \qquad \Rightarrow \theta = \arccos(0) \tag{7}$$

$$\Rightarrow \theta = \frac{\pi}{2} \tag{8}$$

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Let

$$\mathbf{m} = \begin{pmatrix} 3\\2\\-6 \end{pmatrix} \tag{3}$$

$$\mathbf{n} = \begin{pmatrix} 2 \\ -12 \\ -3 \end{pmatrix} \tag{4}$$

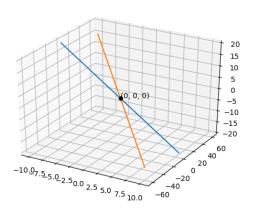


Fig. 1. 3D plot showing the two lines