

EE5600 Assignment 1

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Abstract—This document contains the solution to a Lines and planes problem. Download all python codes from

<https://github.com/Jayanth9969/EE5600/blob/master/Assignment1/code.py>

1 PROBLEM

Find the Angle between the following lines

$$\begin{aligned}(\sqrt{3} \ 1)\mathbf{x} &= 1 \\ (1 \ \sqrt{3})\mathbf{x} &= 4\end{aligned}$$

2 SOLUTION

The **Approach** is : For finding the Angle between these lines we will use dot-Product Formula and with the help of direction vectors we can find angle between these 2 lines.

- a) We will make direction vectors from these line vectors form:

$$\mathbf{m}_1 = (-\sqrt{3} \ 1) \quad (0.1)$$

$$\mathbf{m}_2 = (-1 \ \sqrt{3}) \quad (0.2)$$

Now we will find out magnitudes of each vectors $\mathbf{m}_1, \mathbf{m}_2$:

$$\|\mathbf{m}_1\| = \sqrt{3+1} = 2 \quad (1.1)$$

$$\|\mathbf{m}_2\| = \sqrt{1+3} = 2 \quad (1.2)$$

Thus angle between 2 vectors $\mathbf{m}_1, \mathbf{m}_2$ can be found using dot-product using the formula below,

Let θ be angle between vectors $\mathbf{m}_1, \mathbf{m}_2$ then,

$$\theta = \arccos\left(\frac{\mathbf{m}_1^T \mathbf{m}_2}{\|\mathbf{m}_1\| \cdot \|\mathbf{m}_2\|}\right) \quad (2)$$

By, Putting values into above equation we, get

$$\theta = \arccos\left(\frac{(-\sqrt{3} \ 1)^T (-1 \ \sqrt{3})}{2 \times 2}\right) \quad (3.1)$$

$$\theta = \arccos\left(\frac{2 \times \sqrt{3}}{4}\right) \quad (3.2)$$

$$\theta = \arccos\left(\frac{\sqrt{3}}{2}\right) \quad (3.3)$$

$$\theta = 30^\circ \quad (3.4)$$

Thus the angle between given lines is 30°

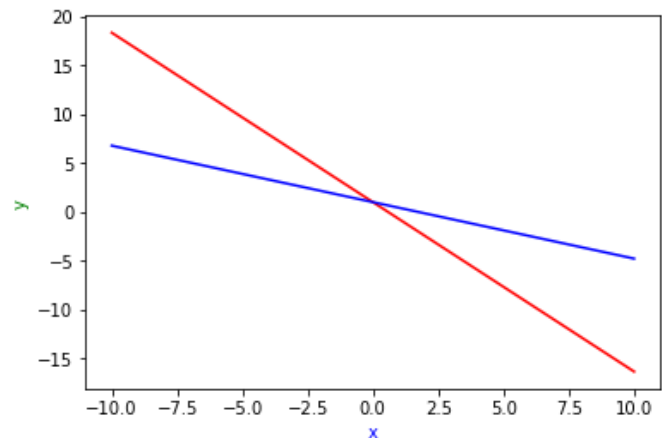


Fig. 2.0.1: Figure