

# 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

$$(\sqrt{3} \ 1)\mathbf{x} = 1$$

$$(1 \ \sqrt{3})\mathbf{x} = 4$$

## 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:

$$\mathbf{m}_1 = (-\sqrt{3} \ 1) \quad (2.0.1)$$

$$\mathbf{m}_2 = (-1 \ \sqrt{3}) \quad (2.0.2)$$

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

$$\|\mathbf{m}_1\| = \sqrt{3 + 1} = 2 \quad (2.0.3)$$

$$\|\mathbf{m}_2\| = \sqrt{1 + 3} = 2 \quad (2.0.4)$$

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

$$\theta = \cos^{-1} \left( \frac{\mathbf{m}_1 \mathbf{m}_2^T}{\|\mathbf{m}_1\| \|\mathbf{m}_2\|} \right) \quad (2.0.5)$$

By, Putting values into above equation we get,

$$\theta = \cos^{-1} \left( \frac{(-\sqrt{3} \ 1) \begin{pmatrix} -1 \\ \sqrt{3} \end{pmatrix}}{2 \times 2} \right) \quad (2.0.6)$$

$$\theta = \cos^{-1} \left( \frac{2 \times \sqrt{3}}{4} \right) \quad (2.0.7)$$

$$\theta = \cos^{-1} \left( \frac{\sqrt{3}}{2} \right) \quad (2.0.8)$$

$$\theta = 30^\circ \quad (2.0.9)$$

Thus the angle between given lines is  $30^\circ$

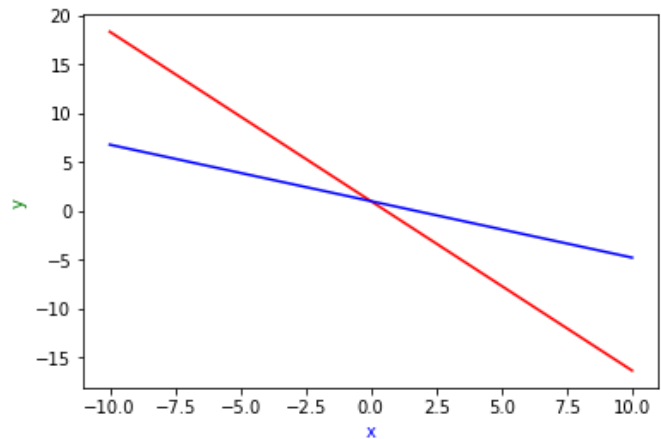


Fig. 2.0.1: Figure