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

$$\begin{pmatrix}\sqrt{3} & 1\end{pmatrix}\mathbf{x} = 1$$
$$\begin{pmatrix}1 & \sqrt{3}\end{pmatrix}\mathbf{x} = 4$$

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:

$$\mathbf{m}_1 = \begin{pmatrix}-\sqrt{3} & 1\end{pmatrix} \tag{2.0.1}$$
$$\mathbf{m}_2 = \begin{pmatrix}-1 & \sqrt{3}\end{pmatrix} \tag{2.0.2}$$

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

$$\|\mathbf{m}_1\| = \sqrt{3+1} = 2 \tag{2.0.3}$$
$$\|\mathbf{m}_2\| = \sqrt{1+3} = 2 \tag{2.0.4}$$

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

$$\theta = \cos^{-1}\left(\frac{\mathbf{m}_1^T\mathbf{m}_2}{\|\mathbf{m_1}\|\|\mathbf{m}_2\|}\right) \tag{2.0.5}$$

By,Putting values into above equation we,get

$$\theta = \cos^{-1}\left(\frac{\begin{pmatrix}-\sqrt{3} & 1\end{pmatrix}^T\begin{pmatrix}-1 & \sqrt{3}\end{pmatrix}}{2\times 2}\right) \tag{2.0.6}$$
$$\theta = \cos^{-1}\left(\frac{2\times\sqrt{3}}{4}\right) \tag{2.0.7}$$
$$\theta = \cos^{-1}\left(\frac{\sqrt{3}}{2}\right) \tag{2.0.8}$$
$$\theta = 30^\circ \tag{2.0.9}$$

Thus the angle between given lines is 30°

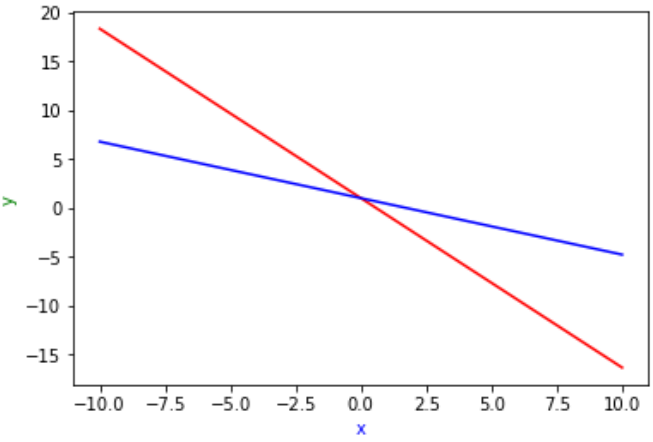

Fig. 2.0.1: Figure