EE5600 Assignment 1

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

1 PROBLEM

Find the Angle between the following lines

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

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:

$$\mathbf{m}_1 = \left(-\sqrt{3} \quad 1 \right) \qquad (0.1)$$
$$\mathbf{m}_2 = \left(-1 \quad \sqrt{3} \right) \qquad (0.2)$$

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

$$\|\mathbf{m}_1\| = \sqrt{3+1} = 2 \qquad (1.1)$$
$$\|\mathbf{m}_2\| = \sqrt{1+3} = 2 \qquad (1.2)$$

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,

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

By,Putting values into above equation we,get

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

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

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

$$\theta = 30° \qquad (3.4)$$

Thus the angle between given lines is 30°