

Assignment 1

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Abstract—This document explains the concept of finding the angle between the two vectors

Download all python codes from

<https://github.com/neharani289/ee14014/blob/master/Assignment%20Matrix%20Theory%20.ipynb>

and latex-tikz codes from

<https://github.com/neharani289/ee14014>

$$\begin{aligned}\theta &= \cos^{-1}\left(\frac{2\sqrt{3}}{(\sqrt{4})(\sqrt{4})}\right) \\ &= \cos^{-1}\left(\frac{2\sqrt{3}}{4}\right) \\ \theta &= 30^\circ\end{aligned}$$

$$\theta = \cos^{-1}\left(\frac{\mathbf{n1}^T \mathbf{n2}}{\|\mathbf{n1}\| \|\mathbf{n2}\|}\right) \quad \|\mathbf{n1}\| = \sqrt{(-1)^2 + \sqrt{3}^2} = \sqrt{4} \quad \|\mathbf{n2}\| = \sqrt{(-1)^2 + \sqrt{3}^2} = \sqrt{4}$$

Result : Angle between the vectors $\mathbf{n1}$ and $\mathbf{n2}$ is : $\theta = 30^\circ$

1 PROBLEM

Find the angle between the lines

$$(1 - \sqrt{3})x = 5$$

$$(\sqrt{3} - 1)x = -6$$

2 ANGLE BETWEEN THE TWO VECTORS :

Consider the two vectors , $\mathbf{n1}$ and $\mathbf{n2}$,

Dot product between two vectors $\mathbf{n1}$ and $\mathbf{n2}$ is given by ,

$$\mathbf{n1}^T \mathbf{n2} = \|\mathbf{n1}\| \|\mathbf{n2}\| \cos \theta \quad (2.0.1)$$

Where angle between the vectors \mathbf{a} and \mathbf{b} is denoted by θ

3 SOLUTION

$$\text{Let , } \mathbf{n1} = \begin{pmatrix} -1 \\ \sqrt{3} \end{pmatrix} \quad \mathbf{n2} = \begin{pmatrix} -\sqrt{3} \\ 1 \end{pmatrix}$$

Angle between the vectors is given by,

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$$\theta = \cos^{-1}\left(\frac{\mathbf{n1}^T \mathbf{n2}}{\|\mathbf{n1}\| \|\mathbf{n2}\|}\right)$$

$$\|\mathbf{n1}\| = \sqrt{(-1)^2 + \sqrt{3}^2} = \sqrt{4}$$

$$\|\mathbf{n2}\| = \sqrt{(-\sqrt{3})^2 + (-1)^2} = \sqrt{4}$$

$$\begin{aligned}\mathbf{n1}^T \mathbf{n2} &= (-1)(-\sqrt{3}) \\ &+ (1)(\sqrt{3}) \\ &= 2\sqrt{3}\end{aligned}$$