

EE5609 Assignment 1

Raghav Girgaonkar

Abstract—This document contains the solution to find the angle between two lines. Which gives us

Download all python codes from

<https://github.com/ArcticSoup/EE5609-Matrix-Theory/tree/master/Codes>

and latex-tikz codes from

<https://github.com/ArcticSoup/EE5609-Matrix-Theory/tree/master/Assignment1>

$$\begin{aligned}\cos \theta &= \frac{8}{5\sqrt{3}} \\ \Rightarrow \theta &= \arccos \frac{8}{5\sqrt{3}} \\ \Rightarrow \theta &= 22.517^\circ\end{aligned}$$

1 PROBLEM

Find the angle between the pair of lines

$$\begin{aligned}\frac{x+3}{3} &= \frac{y-1}{5} = \frac{z+3}{4} \\ \frac{x+1}{1} &= \frac{y-4}{1} = \frac{z-5}{2}\end{aligned}$$

2 SOLUTION

Using the definition of a line in co-ordinate geometry, we see from the above two equations, the direction vectors **a** and **b** of the two lines are

$$\begin{aligned}\mathbf{a} &= \begin{pmatrix} 3 \\ 5 \\ 4 \end{pmatrix} \\ \mathbf{b} &= \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}\end{aligned}$$

respectively. In order to find the angle between the two direction vectors, we use the definition of dot product,

$$\cos \theta = \frac{\mathbf{a}^T \mathbf{b}}{\|\mathbf{a}\| \|\mathbf{b}\|} \quad (2.0.1)$$

Which gives us,

$$\begin{aligned}\mathbf{a}^T \mathbf{b} &= 16 \\ \|\mathbf{a}\| &= \sqrt{50}, \|\mathbf{b}\| = \sqrt{6}\end{aligned}$$