

Assignment 1

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Abstract—This document explains how to find a line perpendicular to 2 lines and passing through a point.

Download the python code from

<https://github.com/AddagallaSatyanarayana/AI5006/tree/master/Assignment1>

and latex-tikz codes from

<https://github.com/AddagallaSatyanarayana/AI5006/tree/master/Assignment1/Assignment1.tex>

$$(3 \ -16 \ 7)\mathbf{n} = 0 \quad (2.0.6)$$

$$(3 \ 8 \ -5)\mathbf{n} = 0 \quad (2.0.7)$$

$$\mathbf{n} = (2 \ 3 \ 6) \quad (2.0.8)$$

$$\mathbf{l} = \begin{pmatrix} 1 \\ 2 \\ -4 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ 3 \\ 6 \end{pmatrix} \quad (2.0.9)$$

where λ is any constant.

1 PROBLEM

Find the vector equation of the line passing through the point $\begin{pmatrix} 1 \\ 2 \\ -4 \end{pmatrix}$ and perpendicular to the two lines $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$

2 SOLUTION

Equation of a line \mathbf{l} passing through the point \mathbf{a} and parallel to the line \mathbf{n} is given by:

$$\mathbf{l} = \mathbf{a} + \lambda \mathbf{n} \quad (2.0.1)$$

where λ is some constant. Since the line passes through $\begin{pmatrix} 1 \\ 2 \\ -4 \end{pmatrix}$, $\mathbf{a} = (1 \ 2 \ -4)$

$$\mathbf{l}_1 = \begin{pmatrix} 8 \\ -19 \\ 10 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -16 \\ 7 \end{pmatrix} \quad (2.0.2)$$

$$\mathbf{l}_2 = \begin{pmatrix} 15 \\ 29 \\ 5 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 8 \\ -5 \end{pmatrix} \quad (2.0.3)$$

Let \mathbf{n} be the normal vector to both lines. If \mathbf{m}_1 and \mathbf{m}_2 are the direction vectors of the lines, then

$$\mathbf{m}_1^T \mathbf{n} = 0 \quad (2.0.4)$$

$$\mathbf{m}_2^T \mathbf{n} = 0 \quad (2.0.5)$$

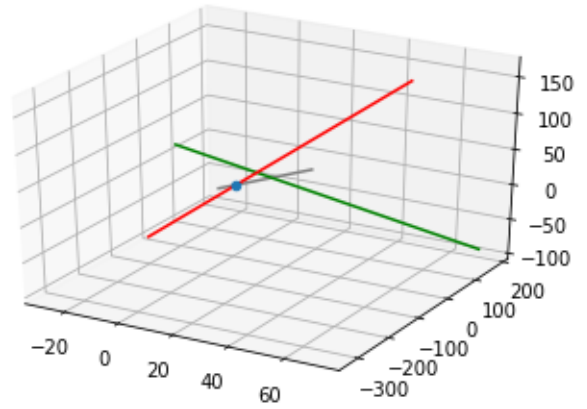


Fig. 0: Perpendicular Line