

Assignment 1

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Abstract—This document explains how to find the point of intersection of a line and a plane.

Download the python code from

<https://github.com/vishalashok98/AI5006/tree/master/Assignment1>

and latex-tikz codes from

<https://github.com/vishalashok98/AI5006/tree/master/Assignment1>

$$\mathbf{x} = \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ -1 \\ -6 \end{pmatrix}$$

3 SOLUTION

Since the line intersects plane, by substituting parametric equation of line in equation of plane we get

$$(2 \ -3 \ 1)(\mathbf{a} + \lambda \mathbf{n}) = 7 \quad (3.0.1)$$

$$(2 \ -3 \ 1)\mathbf{a} + (2 \ -3 \ 1)\lambda \mathbf{n} = 7 \quad (3.0.2)$$

$$(2 \ -3 \ 1) \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix} + (2 \ -3 \ 1) \begin{pmatrix} 1 \\ -1 \\ -6 \end{pmatrix} \lambda = 7 \quad (3.0.3)$$

$$\lambda = \quad (3.0.4)$$

Substituting the value of λ in parametric equations we get point of intersection as $[1, -2, 7]$

1 PROBLEM

Find the co ordinates of the point when the line through $\begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$ crosses the plane $[2 \ 1 \ 1]\mathbf{x}=7$ and perpendicular to the two lines

2 EXPLANATION

Equation of the plane is

$$2x + y + z = 7 \quad (2.0.1)$$

Direction ratios of line passing through points $\begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$ is given by $[1, -1, -6]$

Equation of a line passing through the point \mathbf{a} and having direction ratios \mathbf{n} is given by:

$$\mathbf{x} = \mathbf{a} + \lambda \mathbf{n} \quad (2.0.2)$$

where λ is some constant.

Parametric equations of line passing through $\begin{pmatrix} 3 \\ -4 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$ is

4 PLOT

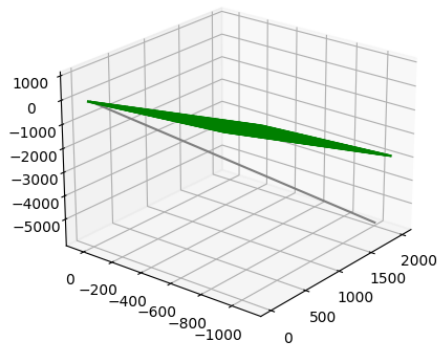


Fig. 0: Intersection of Plane and Line