

Assignment 2

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Abstract—This document finds the equation of a plane which is at a distance of 7 units from origin and normal to $\begin{pmatrix} 3 \\ 5 \\ 6 \end{pmatrix}$

Download all python codes from

https://github.com/Matish007/Matrix-Theory-EE5609-/tree/master/Assignment_2/codes

and latex-tikz codes from

https://github.com/Matish007/Matrix-Theory-EE5609-/tree/master/Assignment_2

1 PROBLEM

Find the equation of a plane which is at a distance of 7 units from origin and normal to $\begin{pmatrix} 3 \\ 5 \\ 6 \end{pmatrix}$

$$\mathbf{n} = \begin{pmatrix} 3 \\ 5 \\ 6 \end{pmatrix} \quad (1)$$

2 EXPLANATION

Let the equation of plane be:-

$$\mathbf{n}^T \mathbf{x} = c \quad (2)$$

where \mathbf{n} =normal vector to the plane

The distance from the origin is given by:-

$$\frac{|c|}{\|\mathbf{n}\|} = 7 \quad (3)$$

$$\|\mathbf{n}\| = \sqrt{3^2 + 5^2 + 6^2} = \sqrt{70} \quad (4)$$

Substituting equation (4) in (3) we get,

$$\frac{|c|}{\sqrt{70}} = 7 \quad (5)$$

$$c = \pm 7 \sqrt{70} \quad (6)$$

Substituting equation (1),(6) in (2) we get two equation of planes,

$$\begin{pmatrix} 3 & 5 & 6 \end{pmatrix} \mathbf{x} = 7 \sqrt{70} \quad (7)$$

$$\begin{pmatrix} 3 & 5 & 6 \end{pmatrix} \mathbf{x} = -7 \sqrt{70} \quad (8)$$

Equation (7) and (8) gives us the equation of two planes which are at a distance of 7 units from origin and normal to $\begin{pmatrix} 3 \\ 5 \\ 6 \end{pmatrix}$

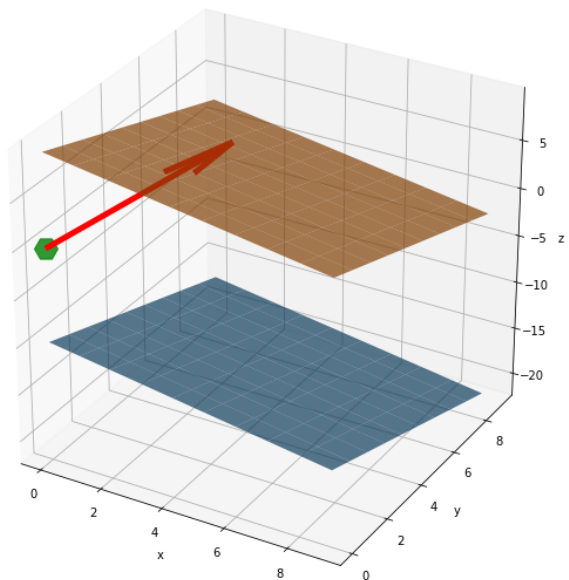


Fig. 1: Planes with Normal vector

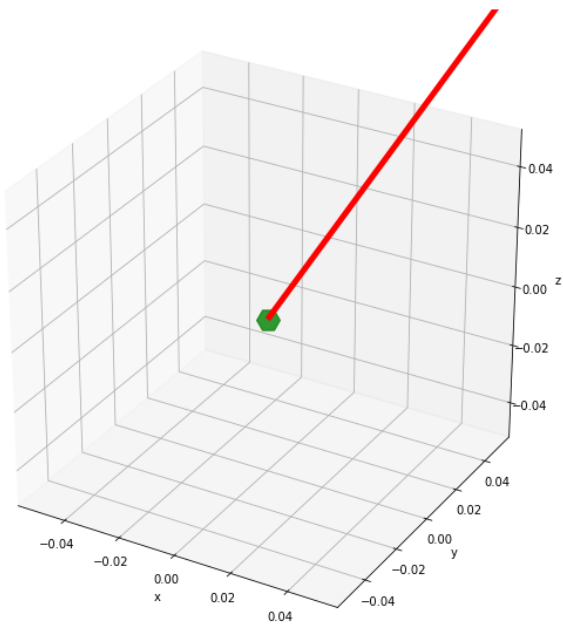


Fig. 2: Normal vector