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** $\begin{pmatrix} 3 \\ 5 \\ -6 \end{pmatrix}$

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1 PROBLEM

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

$$\mathbf{n} = \begin{pmatrix} 3 \\ 5 \\ -6 \end{pmatrix} \tag{1}$$

2 EXPLANATION

Let the equation of plane be:-

$$\mathbf{n}^T \mathbf{x} = c \tag{2}$$

where **n**=normal vector to the plane
The distance from the origin is given by:-

$$\frac{|c|}{\|\mathbf{n}\|} = 7 \tag{3}$$

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

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

$$\frac{|c|}{\sqrt{70}} = 7 \tag{5}$$

$$|c| = 7\sqrt{70} \tag{6}$$

Substituting equation (1),(6) in (2) we get,

$$\begin{pmatrix} 3 & 5 & -6 \end{pmatrix} \mathbf{x} = 7\sqrt{70} \tag{7}$$

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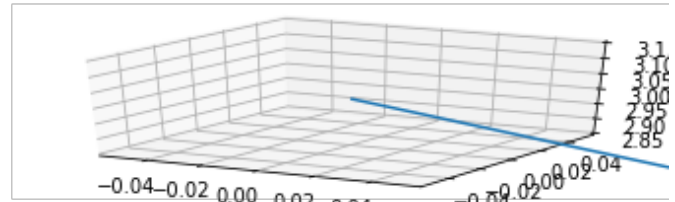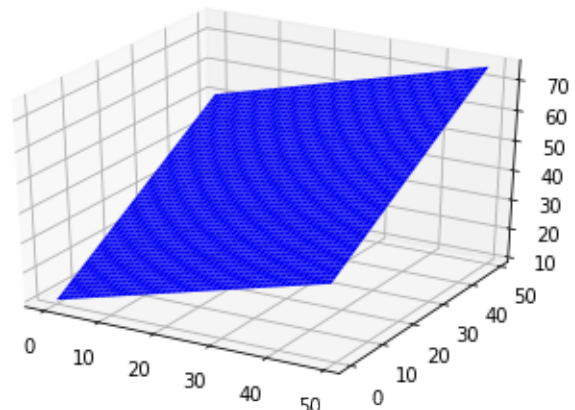

Fig. 1: Normal vector

Fig. 2: Plane