4.7.62

EE25BTECH11065 - Yoshita

Question:
Find the equation of the plane which passes through the point (5, 2, -4) and perpendicular to the line with direction ratios 2, 3, -1.

Solution:
The plane passes through the point

$$\mathbf{A} = \begin{pmatrix} 5 \\ 2 \\ -4 \end{pmatrix}$$

with normal vector

$$\mathbf{n} = \begin{pmatrix} 2 \\ 3 \\ -1 \end{pmatrix}.$$

The equation of the plane can be written as

$$\mathbf{n}^T(\mathbf{x} - \mathbf{A}) = 0.$$

Equivalently,

$$\mathbf{n}^T\mathbf{x} = \mathbf{n}^T\mathbf{A}.$$

Substituting the values,

$$\begin{pmatrix} 2 & 3 & -1 \end{pmatrix}\mathbf{x} = \begin{pmatrix} 2 & 3 & -1 \end{pmatrix}\begin{pmatrix} 5 \\ 2 \\ -4 \end{pmatrix} \tag{1}$$

$$\implies \begin{pmatrix} 2 & 3 & -1 \end{pmatrix}\mathbf{x} = 20. \tag{2}$$

Hence, the equation of the plane is

$$\mathbf{n}^T\mathbf{x} = 20,$$

where

$$\mathbf{n} = \begin{pmatrix} 2 \\ 3 \\ -1 \end{pmatrix}.$$

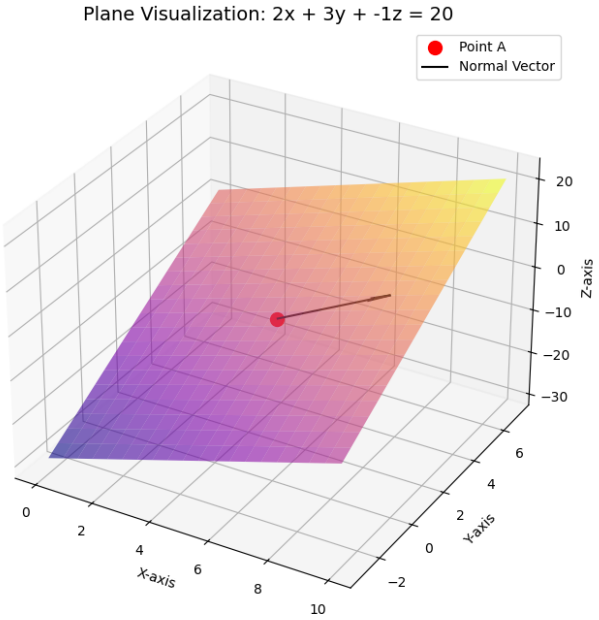

Fig. 0: A plane passing through point A with normal vector n.