

# ASSIGNMENT-3

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Download all python codes from

<https://github.com/ThurpuNaveena/ASSIGNMENT-3/tree/main/CODES>

and latex-tikz codes from

<https://github.com/ThurpuNaveena/ASSIGNMENT-3/tree/main>

Thus, the equation of the plane is

$$(4 \ 0 \ 5)\mathbf{n} = -1 \quad (2.0.9)$$

## 1 QUESTION No-2.36 (A) (LINEAR FORMS)

Find the equation of the planes that passes

through three points  $\begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}, \begin{pmatrix} 6 \\ 4 \\ -5 \end{pmatrix}, \begin{pmatrix} -4 \\ -2 \\ 3 \end{pmatrix}$

## 2 SOLUTION

$$\mathbf{R} = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}, \mathbf{S} = \begin{pmatrix} 6 \\ 4 \\ -5 \end{pmatrix} \text{ and } \mathbf{T} = \begin{pmatrix} -4 \\ -2 \\ 3 \end{pmatrix} \quad (2.0.1)$$

If the equation of the plane is given by

$$\mathbf{n}^T \mathbf{x} = C, \quad (2.0.2)$$

$$\mathbf{n}^T \mathbf{R} = \mathbf{n}^T \mathbf{S} = \mathbf{n}^T \mathbf{T} = C, \quad (2.0.3)$$

$$(\mathbf{R} - \mathbf{S} - \mathbf{T})^T \mathbf{n} = 0 \quad (2.0.4)$$

after some algebra, using row reduction on the above matrix

$$\begin{pmatrix} -5 & -3 & 4 \\ 10 & 6 & -8 \end{pmatrix} \xleftrightarrow{R_1 \rightarrow 2R_1 + R_2} \begin{pmatrix} -10 & 0 & 8 \\ 10 & 6 & -8 \end{pmatrix} \quad (2.0.5)$$

$$\xleftrightarrow{R_2 \rightarrow R_2 + R_1} \begin{pmatrix} -10 & 0 & 8 \\ 0 & 6 & 0 \end{pmatrix} \quad (2.0.6)$$

Thus

$$\mathbf{n} = \begin{pmatrix} \frac{8}{10} \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} \frac{4}{5} \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 4 \\ 0 \\ 5 \end{pmatrix} \quad (2.0.7)$$

$$C = \mathbf{n}^T \mathbf{T} = -1 \quad (2.0.8)$$