

ASSIGNMENT 5

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Latex-tikz codes from

[https://github.com/CRAMYATULASI/
ASSIGNMENT5/tree/main/ASSIGNMENT5](https://github.com/CRAMYATULASI/ASSIGNMENT5/tree/main/ASSIGNMENT5)

\therefore By substituting $\lambda, n_1, n_2, c_1, c_2$ values in (2.0.6) we get required plane equation as,

$$\begin{pmatrix} 1 & 0 & 1 \end{pmatrix} \mathbf{x} = 2 \quad (2.0.10)$$

1 QUESTION No 2.41

Find the equation of the plane through the intersection of the planes

$$\begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \mathbf{x} = 1 \quad (1.0.1)$$

$$\begin{pmatrix} 2 & 3 & 4 \end{pmatrix} \mathbf{x} = 5 \quad (1.0.2)$$

and which is perpendicular to the plane

$$\begin{pmatrix} 1 & -1 & 1 \end{pmatrix} \mathbf{x} = 0 \quad (1.0.3)$$

2 SOLUTION

Equation (1.0.1), (1.0.2) and (1.0.3) can be written as,

$$\mathbf{n}_1^T \mathbf{x} = c_1 \quad (2.0.1)$$

$$\mathbf{n}_2^T \mathbf{x} = c_2 \quad (2.0.2)$$

$$\mathbf{n}_3^T \mathbf{x} = c_3 \quad (2.0.3)$$

Where,

$$\mathbf{n}_1 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}, \mathbf{n}_2 = \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}, \mathbf{n}_3 = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$$

$$c_1 = 1, c_2 = 5, c_3 = 0 \quad (2.0.4)$$

Required equation of plane containing (2.0.1) and (2.0.2) is,

$$\mathbf{n}_1^T \mathbf{x} + \lambda \mathbf{n}_2^T \mathbf{x} = c_1 + \lambda c_2 \quad (2.0.5)$$

$$\implies (\mathbf{n}_1^T + \lambda \mathbf{n}_2^T) \mathbf{x} = c_1 + \lambda c_2 \quad (2.0.6)$$

But (2.0.6) is perpendicular to (2.0.3). So,

$$(\mathbf{n}_3^T)^T (\mathbf{n}_1^T + \lambda \mathbf{n}_2^T) = 0 \quad (2.0.7)$$

$$\implies \lambda = -\frac{\mathbf{n}_3 \mathbf{n}_1^T}{\mathbf{n}_3 \mathbf{n}_2^T} \quad (2.0.8)$$

$$\implies \lambda = \frac{-1}{3} \quad (2.0.9)$$