ASSIGNMENT 4

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Download all python codes from

https://github.com/grajanarsavva/ASSIGNMENT4/tree/main/ASSIGNMENT4/CODES

and latex-tikz codes from

https://github.com/grajanarsavva/ASSIGNMENT4/tree/main/ASSIGNMENT4

1 Question No 2.21

Find the equation of plane passing through the points $\mathrm{a} = \begin{pmatrix} 2 \\ 5 \\ -3 \end{pmatrix}$; $\mathrm{b} = \begin{pmatrix} -2 \\ -3 \\ 5 \end{pmatrix}$ and $\mathrm{c} = \begin{pmatrix} 5 \\ 3 \\ -3 \end{pmatrix}$.

2 SOLUTION

The equation of plane is as $\mathrm{n}^T x = 1$

$$\begin{pmatrix} 2 & 5 & -3 \\ -2 & -3 & 5 \\ 5 & 3 & -3 \end{pmatrix} \mathbf{n} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \tag{2.0.1}$$

Row reducing the argumented matrix ,

$$\begin{pmatrix} 2 & 5 & -3 & 1 \\ -2 & -3 & 5 & 1 \\ 5 & 3 & -3 & 1 \end{pmatrix} \tag{2.0.2}$$

$$\xleftrightarrow[R_3 \leftarrow 2R_3 - 5R_1]{R_2 \leftarrow \frac{R_2+R_1}{2}} \begin{pmatrix} 2 & 5 & -3 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & -19 & 9 & -3 \end{pmatrix} \tag{2.0.3}$$

$$\xleftrightarrow[R_3 \leftarrow \frac{R_3+19R_2}{4}]{R_3 \leftarrow R_1 - 5R_2} \begin{pmatrix} 2 & 0 & -8 & -4 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 7 & 4 \end{pmatrix} \tag{2.0.4}$$

$$\xleftrightarrow[R_1 \leftarrow \frac{7R_1+8R_2}{2}]{R_3 \leftarrow 7R_2 - R_3} \begin{pmatrix} 7 & 0 & 0 & 2 \\ 0 & 7 & 0 & 3 \\ 0 & 0 & 7 & 4 \end{pmatrix} \tag{2.0.5}$$

$$\implies \mathbf{n} = \frac{1}{7} \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix} \tag{2.0.6}$$

Thus,the equation of the plane passing through the given points is

$$\begin{pmatrix} 2 & 3 & 4 \end{pmatrix} \mathbf{x} = 7 \tag{2.0.7}$$

Plot of the plane

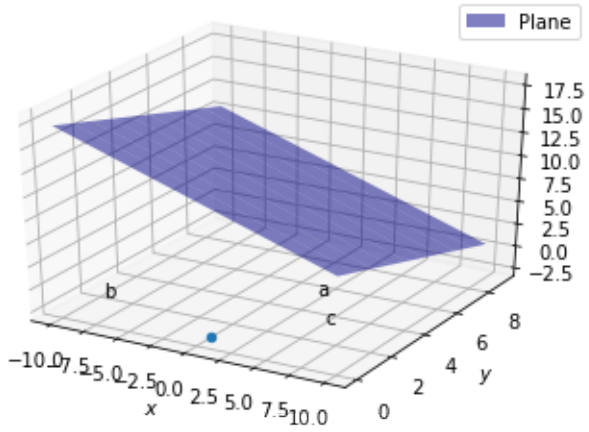

Fig. 2.1: Plot of the plane