ASSIGNMENT 12.11.3.6

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1 PROBLEM 1

1. Find the equations of the planes that passes through three points.

1) $\mathbf{A} = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 6 \\ 4 \\ -5 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} -4 \\ -2 \\ 3 \end{pmatrix}$

2) $\mathbf{A} = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} -2 \\ 2 \\ -1 \end{pmatrix}$

2 SOLUTION FOR 1

Equation of plane is given by,

$$m^\top \mathbf{x} = c \qquad (2.0.1)$$

$$\implies \begin{pmatrix} 1 & 1 & -1 \\ 6 & 4 & -5 \\ -4 & -2 & 3 \end{pmatrix}^\top \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ -25 \\ 9 \end{pmatrix} \qquad (2.0.2)$$

$$\implies \begin{pmatrix} 1 & 6 & -4 \\ 1 & 4 & -2 \\ -1 & -5 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ -25 \\ 9 \end{pmatrix} \qquad (2.0.3)$$

3 SOLUTION FOR 2

Equation of plane is given by,

$$m^\top \mathbf{x} = c \qquad (3.0.1)$$

$$\implies \begin{pmatrix} 1 & 1 & 0 \\ 1 & 2 & 1 \\ -2 & 2 & -1 \end{pmatrix}^\top \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 5 \\ -5 \end{pmatrix} \qquad (3.0.2)$$

$$\implies \begin{pmatrix} 1 & 1 & -2 \\ 1 & 2 & 2 \\ 0 & 1 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 5 \\ -5 \end{pmatrix} \qquad (3.0.3)$$
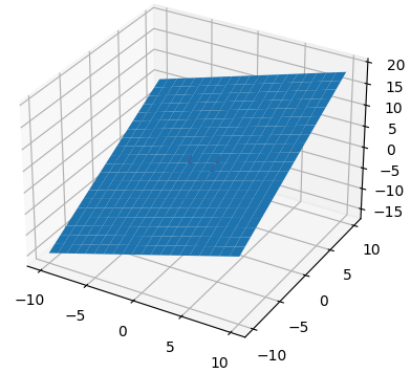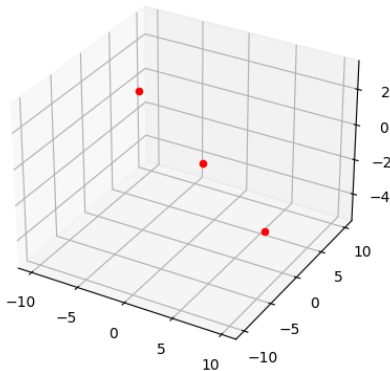

Fig. 2: Plane passing through the given points

Fig. 2: The figure shows that the given points are collinear