

ASSIGNMENT 7

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Download all python codes from

<https://github.com/Sowmyabandi99/Assignment7/blob/main/Assignment7/assignment7.py>

Latex-tikz codes from

<https://github.com/Sowmyabandi99/Assignment7/blob/main/Assignment7/main.tex>

1 QUESTION No 2.29

Find the equation of the set of points \mathbf{P} such that its distances from the points $\mathbf{A} = \begin{pmatrix} 3 \\ 4 \\ -5 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} -2 \\ 1 \\ 4 \end{pmatrix}$ are equal.

2 SOLUTION

From the given information,

$$\|\mathbf{P} - \mathbf{A}\|^2 = \|\mathbf{P} - \mathbf{B}\|^2 \quad (2.0.1)$$

$$\Rightarrow \left\| \mathbf{P} - \begin{pmatrix} 3 \\ 4 \\ -5 \end{pmatrix} \right\|^2 = \left\| \mathbf{P} - \begin{pmatrix} -2 \\ 1 \\ 4 \end{pmatrix} \right\|^2 \quad (2.0.2)$$

$$\Rightarrow \|\mathbf{P}\|^2 + \left\| \begin{pmatrix} 3 \\ 4 \\ -5 \end{pmatrix} \right\|^2 - 2 \begin{pmatrix} 3 & 4 & -5 \end{pmatrix} \mathbf{P} \quad (2.0.3)$$

$$= \|\mathbf{P}\|^2 + \left\| \begin{pmatrix} -2 \\ 1 \\ 4 \end{pmatrix} \right\|^2 - 2 \begin{pmatrix} -2 & 1 & 4 \end{pmatrix} \mathbf{P} \quad (2.0.4)$$

$$\Rightarrow \begin{pmatrix} -6 & -8 & 10 \end{pmatrix} \mathbf{P} + \begin{pmatrix} -4 & 2 & 8 \end{pmatrix} \mathbf{P} \quad (2.0.5)$$

$$= 21 - 50 \quad (2.0.6)$$

$$\Rightarrow \begin{pmatrix} 10 & 6 & -18 \end{pmatrix} \mathbf{P} = 29 \quad (2.0.7)$$

\therefore The required equation is

$$\begin{pmatrix} 10 & 6 & -18 \end{pmatrix} \mathbf{P} = 29 \quad (2.0.8)$$

Plot of the equation whose distance from the points A and B are equal-

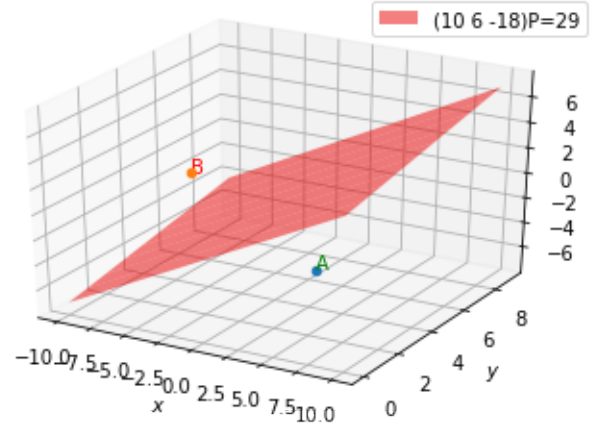


Fig. 2.1: Plot of the plane