1-1.5-27

AI24BTECH11002 - K.AKSHAY TEJA

Question:
Show that the points $\mathbf{P}\left(-2,3,5\right), \mathbf{Q}\left(1,2,3\right)$ and $\mathbf{R}\left(7,0,-1\right)$ are collinear.
Solution:

Variable	Description
P	$(-2,3,5)$
Q	$(1,2,3)$
R	$(7,0,-1)$

TABLE 0: Coordinates of points P, Q and R

Points $\mathbf{P}, \mathbf{Q}$and$\mathbf{R}$ are collinear if

$$\text{rank}\begin{pmatrix}\mathbf{P} & \mathbf{Q} & \mathbf{R}\end{pmatrix}^{\top} = 2 \tag{0.1}$$

$$\implies \begin{pmatrix}-2 & 3 & 5\\ 1 & 2 & 3\\ 7 & 0 & -1\end{pmatrix} \xleftrightarrow{R_2 \to 2R_2 + R_3} \begin{pmatrix}-2 & 3 & 5\\ 0 & 7 & 11\\ 7 & 0 & -1\end{pmatrix} \tag{0.2}$$

$$\xleftrightarrow{R_3 \to 2R_3 + 7R_1} \begin{pmatrix}-2 & 3 & 5\\ 0 & 7 & 11\\ 0 & 21 & 33\end{pmatrix} \xleftrightarrow{R_3 \to R_3 - 3R_2} \begin{pmatrix}-2 & 3 & 5\\ 0 & 7 & 11\\ 0 & 0 & 0\end{pmatrix} \tag{0.3}$$

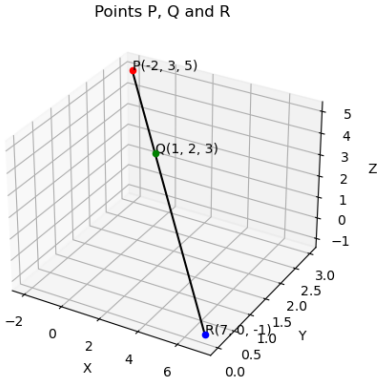

Fig. 0.1: Plot of points P, Q and R