

# 1-1.5-27

AI24BTECH11002 - K.AKSHAY TEJA

## Question:

Show that the points  $\mathbf{P} = \begin{pmatrix} -2 \\ 3 \\ 5 \end{pmatrix}$ ,  $\mathbf{Q} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$  and  $\mathbf{R} = \begin{pmatrix} 7 \\ 0 \\ -1 \end{pmatrix}$  are collinear.

## Solution:

Variable	Description
Point P	$\begin{pmatrix} -2 \\ 3 \\ 5 \end{pmatrix}$
Point Q	$\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$
Point R	$\begin{pmatrix} 7 \\ 0 \\ -1 \end{pmatrix}$

TABLE 0: Coordinates of Points P, Q and R

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

$$\text{rank}(\mathbf{P} \quad \mathbf{Q} \quad \mathbf{R})^T = 2 \quad (0.1)$$

$$\Rightarrow \begin{pmatrix} -2 & 3 & 5 \\ 1 & 2 & 3 \\ 7 & 0 & -1 \end{pmatrix} \xleftrightarrow{R_2 \leftarrow -2R_2 + R_3} \begin{pmatrix} -2 & 3 & 5 \\ 0 & 7 & 11 \\ 7 & 0 & -1 \end{pmatrix} \quad (0.2)$$

$$\xleftrightarrow{R_3 \leftarrow -2R_3 + 7R_1} \begin{pmatrix} -2 & 3 & 5 \\ 0 & 7 & 11 \\ 0 & 21 & 33 \end{pmatrix} \xleftrightarrow{R_3 \leftarrow R_3 - 3R_2} \begin{pmatrix} -2 & 3 & 5 \\ 0 & 7 & 11 \\ 0 & 0 & 0 \end{pmatrix} \quad (0.3)$$

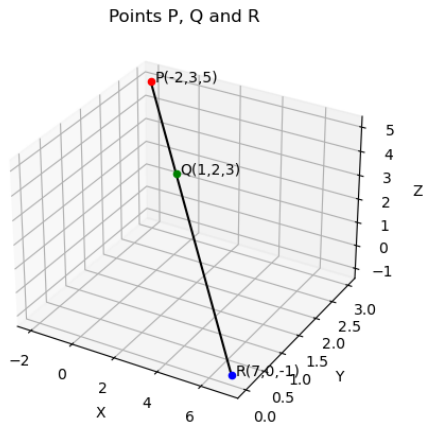


Fig. 0.1: Plot of Points P, Q and R