

1.1.6.27

EE24BTECH11057 - SHIVAM SHILVANT*

Question:

Prove that the three points $(-4, 6, 10)$, $(2, 4, 6)$ and $(14, 0, -2)$ are collinear.

Solution:

Variable	Description	Formula
A	A 3d Point to be plotted	$A = \begin{pmatrix} -4 & 6 & 10 \end{pmatrix}$
B	A 3d Point to be plotted	$B = \begin{pmatrix} 2 & 4 & 6 \end{pmatrix}$
C	A 3d Point to be plotted	$C = \begin{pmatrix} 14 & 0 & -2 \end{pmatrix}$
M	It is a matrix comprising of vectors $B - A$ and $C - A$	$M = [B - A, C - A]$

TABLE 0

If the rank of a matrix M is 1, then the points A,B,C are collinear.

$$\text{Rank}(M) = 1 \quad (0.1)$$

Computing matrix M

$$M = \begin{pmatrix} 6 & -2 & -4 \\ 18 & -6 & -12 \end{pmatrix} \xrightarrow{R_2 \rightarrow R_2 - 3R_1} \begin{pmatrix} 6 & -2 & -4 \\ 0 & 0 & 0 \end{pmatrix} \quad (0.2)$$

Thus we can conclude that the rank of matrix M is 1 and thus A,B,C are collinear.
i.e.the given points are collinear.

Points A, B, and C Are Collinear

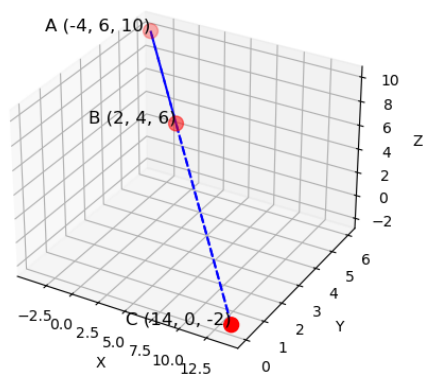


Fig. 0.1