1.7.3

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Question:
Show that the points $A(-2\hat{i} + 3\hat{j} + 5\hat{k})$, $B(\hat{i} + 2\hat{j} + 3\hat{k})$, and $C(7\hat{i} - \hat{k})$ are collinear.
Solution:
Let us solve the given equation theoretically and then verify the solution computationally
According to the question,
Given position vectors,

$$\mathbf{A} = \begin{pmatrix} -2 \\ 3 \\ 5 \end{pmatrix} \mathbf{B} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \mathbf{C} = \begin{pmatrix} 7 \\ 0 \\ -1 \end{pmatrix} \tag{0.1}$$

To show that these are points are collinear,we show that echolon matrix $\mathbf{S}$ Rank=1

$$\mathbf{S} = \begin{pmatrix} \mathbf{B} - \mathbf{A} & \mathbf{C} - \mathbf{A} \end{pmatrix}^{T} \tag{0.2}$$

$$\mathbf{S} = \begin{pmatrix} 3 & -1 & -2 \\ 9 & -3 & -6 \end{pmatrix} \tag{0.3}$$

By doing $R_2=R_2-3R_1$ we get

$$\mathbf{S} = \begin{pmatrix} 3 & -1 & -2 \\ 0 & 0 & 0 \end{pmatrix} \tag{0.4}$$

So the Rank of matrix $\mathbf{S}$ is 1
$\therefore$ The points are collinear.

From the figure it is clearly verified that the theoretical solution matches with the computational solution.