Assignment - 2

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MD/2020/706

Abstract—**This is a simple document to learn about vectors and matrices and present it using latex, draw figures using Python, Latex.**

Download all and latex-tikz codes from

1 VECTORS
(POINTS AND VECTORS BY G V V SHARMA EXERCISES-Q.2.14)

1.1. show that $\begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}, \begin{pmatrix} -1 \\ -2 \\ 1 \end{pmatrix}$, and $\begin{pmatrix} 5 \\ 8 \\ 7 \end{pmatrix}$ are collinear.

Solution:

a) Let

$$\mathbf{A} = \begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -1 \\ -2 \\ 1 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 5 \\ 8 \\ 7 \end{pmatrix} \qquad (1.1.1)$$

Then,

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} -3 \\ -5 \\ -3 \end{pmatrix}, \mathbf{C} - \mathbf{A} = \begin{pmatrix} 3 \\ 5 \\ 3 \end{pmatrix} \qquad (1.1.2)$$

and

$$\mathbf{M} = \begin{pmatrix} \mathbf{B} - \mathbf{A} & \mathbf{C} - \mathbf{A} \end{pmatrix}^T \qquad (1.1.3)$$

$$= \begin{pmatrix} -3 & -5 & -3 \\ 3 & 5 & 3 \end{pmatrix} \xleftrightarrow{R_2 \leftarrow R_1 + R_2} \begin{pmatrix} -3 & -5 & -3 \\ 0 & 0 & 0 \end{pmatrix} \qquad (1.1.4)$$
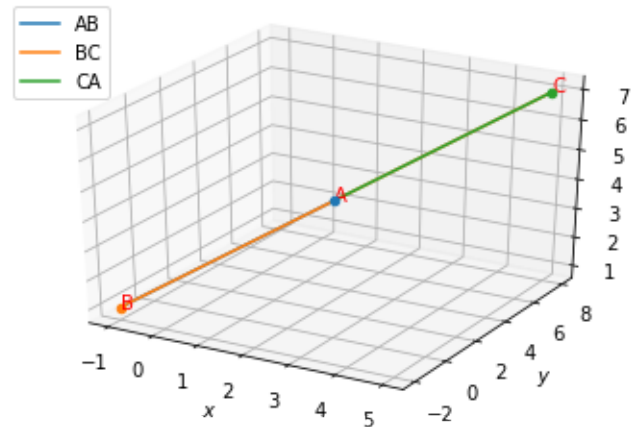
$$\implies rank(\mathbf{M}) = 1 \iff R_2 = \mathbf{0}$$

Fig. 1.1. collinear points