



Assignment - 12.10.5.4

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CONTENTS

I. PROBLEM

if $\mathbf{a} = \mathbf{b} + \mathbf{c}$, then is true that $|\mathbf{a}| = |\mathbf{b}| + |\mathbf{c}|$?
Justify your answer .

II. SOLUTION

Given

$$\mathbf{a} = \mathbf{b} + \mathbf{c}$$

let

$$\mathbf{b} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, \mathbf{c} = \begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix}$$

thus

$$\mathbf{a} = \mathbf{b} + \mathbf{c} \quad (3)$$

$$= \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix} \quad (4)$$

$$\|\mathbf{a}\| = \mathbf{a}^T \mathbf{a} \quad (5)$$

$$= (3 \ 1 \ 1) \begin{pmatrix} 3 \\ 1 \\ 1 \end{pmatrix} \quad (6)$$

$$= \sqrt{9 + 1 + 1} \quad (7)$$

$$= \sqrt{11} \quad (8)$$

$$\|\mathbf{b}\| = \mathbf{b}^T \mathbf{b} \quad (9)$$

$$= (1 \ 2 \ 3) \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \quad (10)$$

$$= \sqrt{1 + 4 + 9} \quad (11)$$

$$= \sqrt{14} \quad (12)$$

$$\|\mathbf{c}\| = \mathbf{c}^T \mathbf{c} \quad (13)$$

$$= (2 \ -1 \ -2) \begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix} \quad (14)$$

$$= \sqrt{4 + 1 + 4} \quad (15)$$

$$= \sqrt{9} \quad (16)$$

$$= 3 \quad (17)$$

Now

$$|\mathbf{a}| \neq |\mathbf{b}| + |\mathbf{c}|$$

(1) <https://github.com/sssurajit/fwc/blob/main/vectors/12.10.5.4/codes/code.py>

(2) Execute the code by using the command
python3 code.py