Assignment - 12.10.4.4

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I. PROBLEM

Show that $\left(\mathbf{a}-\mathbf{b}\right)\times\left(\mathbf{a}+\mathbf{b}\right)=2\left(\mathbf{a}\times\mathbf{b}\right)$

II. SOLUTION

Consider

$$\mathbf{a}=\begin{pmatrix}1\\1\end{pmatrix},\mathbf{b}=\begin{pmatrix}2\\1\end{pmatrix} \tag{1}$$

$$\left(\mathbf{a}-\mathbf{b}\right)\times\left(\mathbf{a}+\mathbf{b}\right)=2\left(\mathbf{a}\times\mathbf{b}\right) \tag{2}$$

where

$$\left(\mathbf{a}-\mathbf{b}\right)=\begin{pmatrix}-1\\0\end{pmatrix} \tag{3}$$

$$\left(\mathbf{a}+\mathbf{b}\right)=\begin{pmatrix}3\\2\end{pmatrix} \tag{4}$$

$$\text{LHS}=\left(\mathbf{a}-\mathbf{b}\right)\times\left(\mathbf{a}+\mathbf{b}\right) \tag{5}$$

$$=\begin{vmatrix}-1&3\\0&2\end{vmatrix} \tag{6}$$

$$=-2 \tag{7}$$

$$\text{RHS}=2\left(\mathbf{a}\times\mathbf{b}\right) \tag{8}$$

$$=\begin{vmatrix}1&2\\0&1\end{vmatrix} \tag{9}$$

$$=2\left(-1\right) \tag{10}$$

$$=-2 \tag{11}$$

Therefore

LHS = RHS

https://github.com/sssurajit/fwc/blob/main/vectors/12.10.4.4/codes/code.py

Execute the code by using the command
python3 code.py