



# Assignment - 12.10.4.4

Surajit Sarkar

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### I. PROBLEM

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

### II. SOLUTION

Consider

$$\mathbf{a} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \mathbf{b} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \quad (1)$$

$$(\mathbf{a} - \mathbf{b}) \times (\mathbf{a} + \mathbf{b}) = 2(\mathbf{a} \times \mathbf{b}) \quad (2)$$

where

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

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

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

$$= \begin{vmatrix} -1 & 3 \\ 0 & 2 \end{vmatrix} \quad (6)$$

$$= -2 \quad (7)$$

$$\text{RHS} = 2(\mathbf{a} \times \mathbf{b}) \quad (8)$$

$$= 2 \begin{vmatrix} 1 & 2 \\ 0 & 1 \end{vmatrix} \quad (9)$$

$$= 2(-1) \quad (10)$$

$$= -2 \quad (11)$$

Therefore

$$\text{LHS} = \text{RHS}$$

<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**