

Answer on Question #46873 – Physics – Other

Question.

Find the vector product $\vec{a} \times \vec{b}$. If $\vec{a} = \vec{i} + 2\vec{j} - \vec{k}$ and $\vec{b} = 2\vec{i} + 3\vec{j} + \vec{k}$

$$5\vec{i} - 3\vec{j} - \vec{k}$$

$$2\vec{i} - 4\vec{j} - \vec{k}$$

$$3\vec{i} + \vec{j} - \vec{k}$$

$$\vec{i} - \vec{j} + 3\vec{k}$$

Solution.

Let write the coordinates of vectors in our basis:

$$\vec{a} = (1; 2; -1)$$

$$\vec{b} = (2; 3; 1)$$

By definition we can find the vector product as the determinant of the following matrix:

$$\vec{a} \times \vec{b} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ a_i & a_j & a_k \\ b_i & b_j & b_k \end{vmatrix}, \text{ where}$$

a_i, a_j, a_k are the components of vector \vec{a} ;

b_i, b_j, b_k are the components of vector \vec{b} .

So, calculate the vector product:

$$\vec{a} \times \vec{b} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 2 & -1 \\ 2 & 3 & 1 \end{vmatrix} = \vec{i}(2 + 3) + \vec{j}(-2 - 1) + \vec{k}(3 - 4) = 5\vec{i} - 3\vec{j} - \vec{k}$$

Answer.

$$5\vec{i} - 3\vec{j} - \vec{k}$$