21-S-4-2-AG-061

What is the cross product of $A = (A_x, A_y, A_z)$ and $B = (B_x, B_y, B_z)$? What about $B \times A$?

ANSWER:

The cross of product $A \times B$ is found using

$$\boldsymbol{A} \times \boldsymbol{B} = \langle A_x \quad A_y \quad A_z \rangle \times \langle B_x \quad B_y \quad B_z \rangle = \begin{vmatrix} \boldsymbol{i} & \boldsymbol{j} & \boldsymbol{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

$$= (A_y \cdot B_z - A_z \cdot B_y)\boldsymbol{i} - (A_x \cdot B_z - A_z \cdot B_x)\boldsymbol{j} + (A_x \cdot B_y - A_y \cdot B_x)\boldsymbol{k}$$

Meanwhile, the cross product $B \times A$ is found using

$$\boldsymbol{B} \times \boldsymbol{A} = \langle B_x \quad B_y \quad B_z \rangle \times \langle A_x \quad A_y \quad A_z \rangle = \begin{vmatrix} \boldsymbol{i} & \boldsymbol{j} & \boldsymbol{k} \\ B_x & B_y & B_z \\ A_x & A_y & A_z \end{vmatrix}$$

$$= (B_y \cdot A_z - B_z \cdot A_y)\boldsymbol{i} - (B_x \cdot A_z - B_z \cdot A_x)\boldsymbol{j} + (B_x \cdot A_y - B_y \cdot A_x)\boldsymbol{k}$$