Vector or Cross product

The vector or cross product of two vectors is defined by:

$$\boldsymbol{A} \times \boldsymbol{B} = AB \sin\theta\, \hat{n}$$

Where $\hat{n}$ is a unit vector and it is perpendicular to the plane containing $\boldsymbol{A}$ *and* $\boldsymbol{B}$.

Characteristics of vector product:

- The cross product is not commutative,

$$\boldsymbol{A} \times \boldsymbol{B} = -\boldsymbol{B} \times \boldsymbol{A}$$

- The cross product of two parallel vectors or anti-parallel vectors is null vector.

i.e. $$\boldsymbol{A} \times \boldsymbol{B} = AB \sin 0° \hat{n} = 0$$

- The cross product of unit vector with itself is also zero.

$$\hat{\boldsymbol{\imath}} \times \hat{\boldsymbol{\imath}} = \hat{\boldsymbol{\jmath}} \times \hat{\boldsymbol{\jmath}} = \hat{\boldsymbol{k}} \times \hat{\boldsymbol{k}} = 0$$

Also $$\boldsymbol{A} \times \boldsymbol{A} = \boldsymbol{0}$$

- The cross product of two mutually perpendicular vectors has maximum value which is given by:

$$\boldsymbol{A} \times \boldsymbol{B} = AB\hat{n}$$

- The cross product of unit vectors along x-axis, y-axis and z-axis is given by:

$$\hat{\boldsymbol{\imath}} \times \hat{\boldsymbol{\jmath}} = \hat{\boldsymbol{k}}$$

$$\hat{\boldsymbol{\jmath}} \times \hat{\boldsymbol{k}} = \hat{\boldsymbol{\imath}}$$

$$\hat{\boldsymbol{k}} \times \hat{\boldsymbol{\imath}} = \hat{\boldsymbol{\jmath}}$$

- Cross product of two vectors in terms of its rectangular components is given by,