

$$\text{ie, } i \times i = j \times j = k \times k = 0$$

4) Vector product of two vectors

$a \times b$, if a & b are vectors then

$$a \times b = ab \sin \theta = \underline{\underline{ab \hat{n}}}$$

$$i \times j = k, \quad j \times k = i \quad \text{and} \quad k \times i = j$$

$$j \times i = -k, \quad k \times j = -i \quad \text{and} \quad i \times k = -j$$

5) Associative law

$$m \vec{a} \times \vec{b} = \vec{a} \times m \vec{b}$$

$$= m(\vec{a} \times \vec{b})$$

6) Distributive law

$$\vec{a} \times (\vec{b} + \vec{c}) = \vec{a} \times \vec{b} + \vec{a} \times \vec{c}$$

7) Vector product in component form

$$\vec{a} \times \vec{b} = \begin{vmatrix} i & j & k \\ a_x & a_y & a_z \\ b_x & b_y & b_z \end{vmatrix} = i(a_y b_z - b_y a_z) - j(a_x b_z - b_x a_z) + k(a_x b_y - b_x a_y)$$

8) Vector product in terms of scalar product

$$\vec{a} \times \vec{b} = ab \sin \theta$$

$$(\vec{a} \times \vec{b})^2 = a^2 b^2 \sin^2 \theta$$

$$= a^2 b^2 (1 - \cos^2 \theta)$$

$$= a^2 b^2 - a^2 b^2 \cos^2 \theta$$

$$= a^2 b^2 - (ab \cos \theta)^2$$

$$= \underline{\underline{a^2 b^2 - (a \cdot b)^2}}$$