Consider cross product between

$$\vec{A} = A_x \hat{x} + A_y \hat{y} + A_z \hat{z}$$

$$\vec{B} = B_x \hat{x} + B_y \hat{y} + B_z \hat{z}$$

Note that $\hat{x} \times \hat{x} = 0$

$\hat{x} \times \hat{y} = \hat{z}$

$\hat{y} \times \hat{z} = \hat{x}$

$\hat{z} \times \hat{x} = \hat{y}$

Method 1

$$\vec{A} \times \vec{B} = (A_x \hat{x} + A_y \hat{y} + A_z \hat{z}) \times (B_x \hat{x} + B_y \hat{y} + B_z \hat{z})$$

$$= A_x B_y \underbrace{\hat{x} \times \hat{y}}_{\hat{z}} + A_x B_z \underbrace{\hat{x} \times \hat{z}}_{-\hat{y}} + \cdots$$

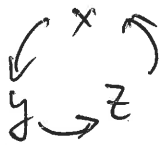
Method 2

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

$$= \hat{x} A_y B_z + \hat{y} A_z B_x + \hat{z} A_x B_y - \hat{x} A_z B_y - \hat{y} A_x B_z - \hat{z} A_y B_x$$

Method 3

= rotation "



$$\vec{A} \times \vec{B}$$

$$= \hat{x}(A_y B_z - A_z B_y) + \hat{y}(A_z B_x - A_x B_z) + \hat{z}(A_x B_y - A_y B_x)$$