Scalar "dot" Product

The dot product of any two vectors is:

$$\vec{A} \cdot \vec{B} = AB\cos\theta$$

It is commutative:

$$\vec{A} \cdot \vec{B} = \vec{B} \cdot \vec{A}$$

It is distributive over the vector addition:

$$\vec{A} \cdot (\vec{B} + \vec{C}) = \vec{A} \cdot \vec{B} + \vec{A} \cdot \vec{C}$$

If $\vec{A} \perp \vec{B}$ then $\vec{A} \cdot \vec{B} = 0$

On unit vectors:

$$\hat{\imath} \cdot \hat{\imath} = 1$$

$$\hat{\jmath} \cdot \hat{\jmath} = 1$$

$$\hat{k} \cdot \hat{k} = 1$$

Any other combination = 0

General equation on arbitrary 3D vectors:

$$\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z$$

Vector "cross" Product

The cross product of any two vectors is:

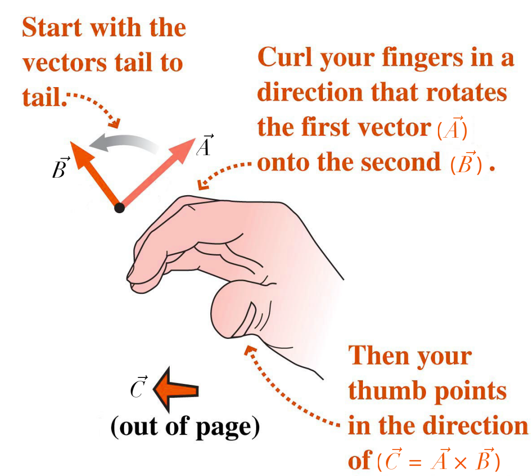
$$\vec{A} \times \vec{B} = \vec{C}$$

where $C = AB\sin\theta$

$\vec{C} \perp \vec{A}$

and $\vec{C} \perp \vec{B}$

The direction of $\vec{C}$ is given by the ***Right-Hand-Rule***:



It is anti-commutative:

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

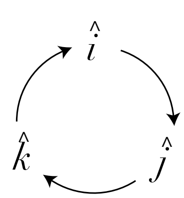
It is distributive over the vector addition:

$$\vec{A} \times (\vec{B} + \vec{C}) = \vec{A} \times \vec{B} + \vec{A} \times \vec{C}$$

$$(\vec{B} + \vec{C}) \times \vec{A} = \vec{B} \times \vec{A} + \vec{C} \times \vec{A}$$

If $\vec{A} \parallel \vec{B}$ then $\vec{A} \times \vec{B} = 0$

On unit vectors:



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

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

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

General equation on arbitrary 3D vectors:

$$\vec{A} \times \vec{B} = (A_y B_z - B_y A_z)\hat{\imath} + (A_z B_x - B_z A_x)\hat{\jmath} + (A_x B_y - B_x A_y)\hat{k}$$