

## A Recap on Vectors

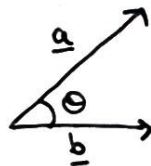
Vectors are a vital part of mechanics and so it is important you are confident in them. They will be covered in great detail in MATH1006 but for now:

### Scalar Product

This is also called the dot product.

$$\underline{a} = (x_1, y_1, z_1)$$

$$\underline{b} = (x_2, y_2, z_2)$$



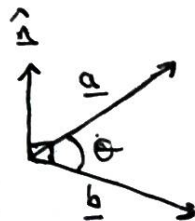
$$\underline{a} \cdot \underline{b} = (x_1 \times x_2) + (y_1 \times y_2) + (z_1 \times z_2)$$

$$\underline{a} \cdot \underline{b} = |\underline{a}| |\underline{b}| \cos \theta$$

where  $\theta$  is the angle between the vectors

if  $\underline{a}$  and  $\underline{b}$  are orthogonal, the scalar product is zero.

### Vector Product



This is also called the cross product.

$$\underline{a} \times \underline{b} = (y_1 z_2 - z_1 y_2) \hat{i} - (x_1 z_2 - z_1 x_2) \hat{j} + (x_1 y_2 - y_1 x_2) \hat{k}$$

$$\underline{a} \times \underline{b} = |\underline{a}| |\underline{b}| (\sin \theta) \hat{n}$$

where  $\theta$  is the angle between the vectors

$\hat{n}$  is the normal of the 2 vectors.