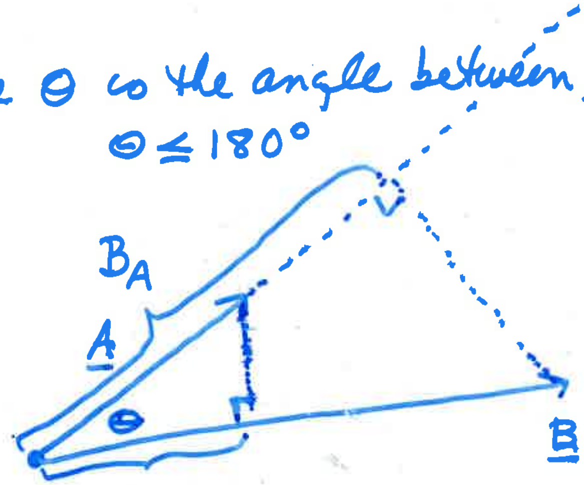
# SCALAR PRODUCT of vectors
## (DOT PRODUCT)

$$\underline{A}\cdot\underline{B} \equiv AB\cos\theta$$

where $\theta$ is the angle between $\underline{A}$ & $\underline{B}$

$\theta \leq 180°$

$$= A_B B$$
$$= A B_A$$




IF $90° < \theta \leq 180°$, $\cos\theta < 0$

$\Rightarrow$ dot product is a signed scalar


NOTE THAT $\underline{A}\cdot\underline{B} = \underline{B}\cdot\underline{A}$

and $\underline{A}\cdot(\underline{B}+\underline{C}) = \underline{A}\cdot\underline{B} + \underline{A}\cdot\underline{C}$ distributive property

for $\underline{i}, \underline{j}, \underline{k}$

$$\underline{i}\cdot\underline{i} = \underline{j}\cdot\underline{j} = \underline{k}\cdot\underline{k} = 1 \qquad \cos 0° = 1$$
$$\underline{i}\cdot\underline{j} = \underline{j}\cdot\underline{k} = \underline{k}\cdot\underline{i} = 0 \qquad \cos 90° = 0$$

general case

$$\underline{A}\cdot\underline{B} = (A_x\underline{i} + A_y\underline{j} + A_z\underline{k})\cdot(B_x\underline{i} + B_y\underline{j} + B_z\underline{k})$$
$$= A_xB_x + A_yB_y + A_zB_z$$
$$= AB\cos\theta$$

useful for finding $\theta$

$$\underline{A}\cdot\underline{A} = A_x^2 + A_y^2 + A_z^2 = A^2$$