

3-D moment couple ctd.

(b10)

VARIGNON'S THEOREM IN 3D

$$\vec{M}_O = \sum (\vec{r} \times \vec{F}) = \vec{r} \times \vec{R} \quad \text{where } \vec{R} = \sum \vec{F}$$

Couples in 3-D same as 2D really

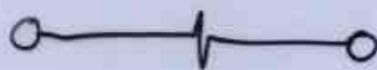
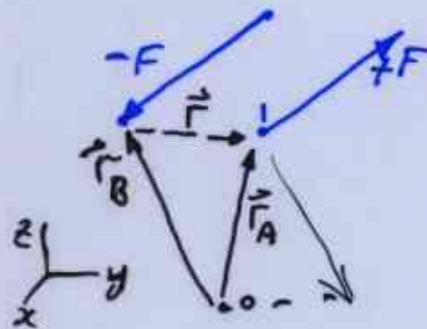
$$M = \vec{r} \times F$$

WHY?

$$\Rightarrow \vec{M}_O = +\vec{r}_A \times \vec{F} - \vec{r}_B \times \vec{F}$$

$$\vec{M} = (\vec{r}_A - \vec{r}_B) \times \vec{F}$$

$$\vec{M} = \vec{r} \times \vec{F}$$



RESULTANTS:

$$\vec{R} = \sum \vec{F}$$

forces

AND

$$\vec{M} = \sum \vec{M}$$

couples

like 2D.

"WRENCH RESULTANT" when resultant force \vec{F} IS PARALLEL TO THE RESULTANT couple.

Positive when \vec{F} & \vec{M} are aligned

