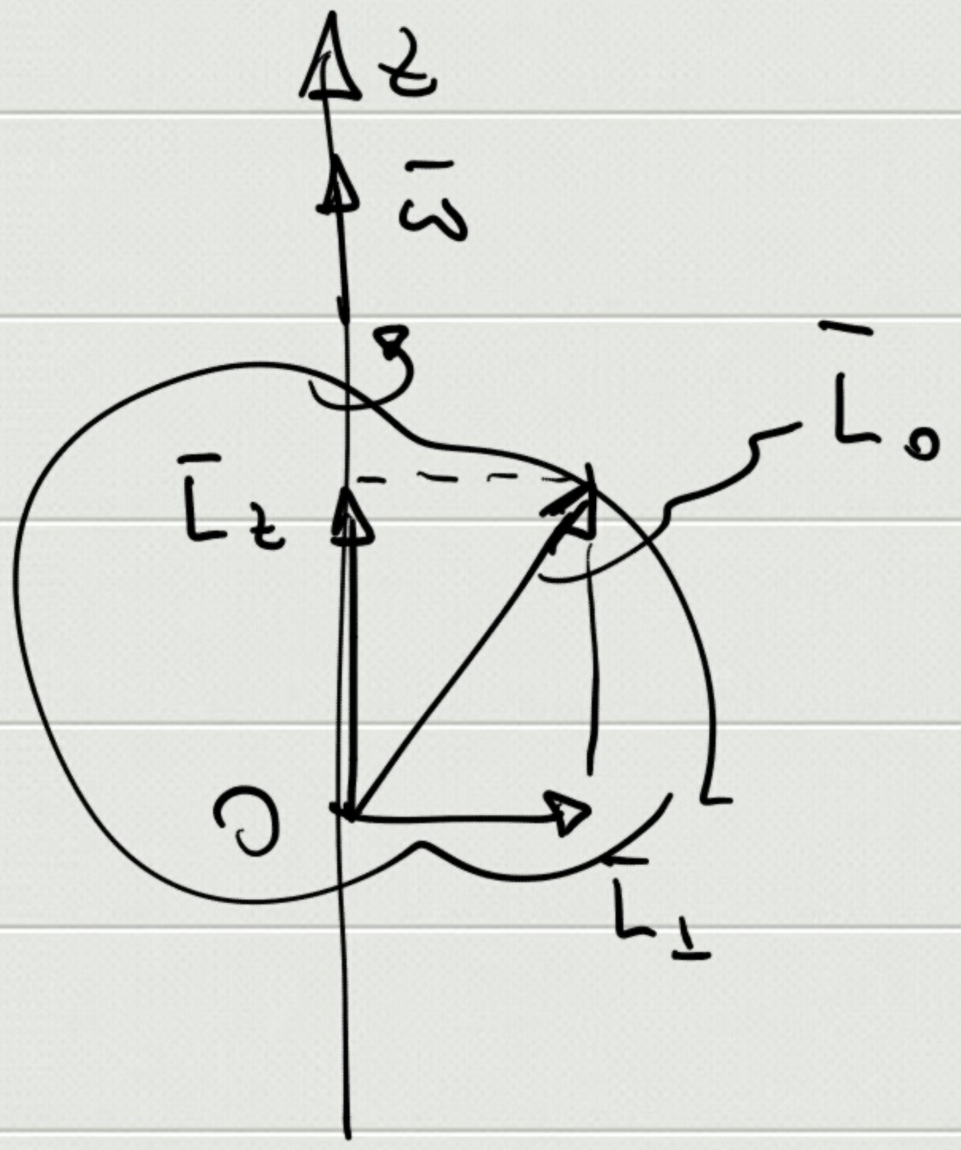
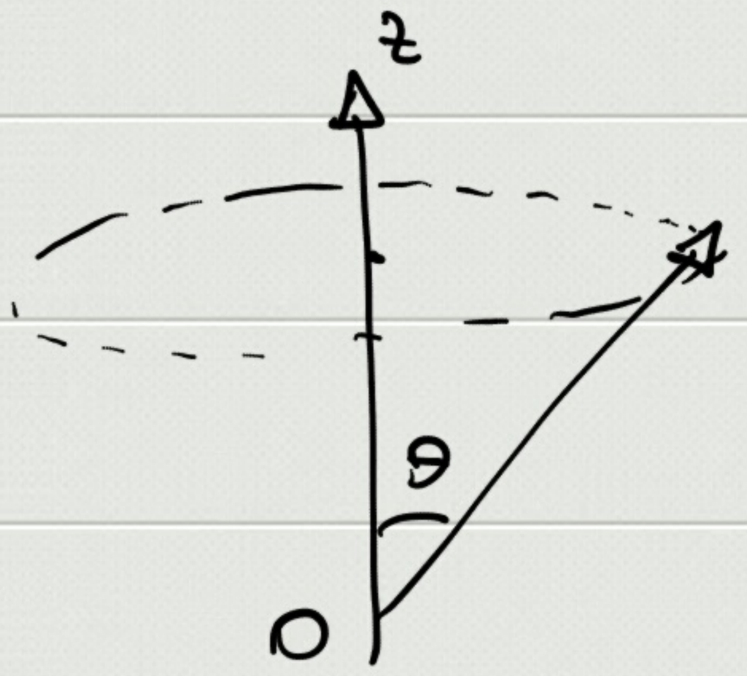


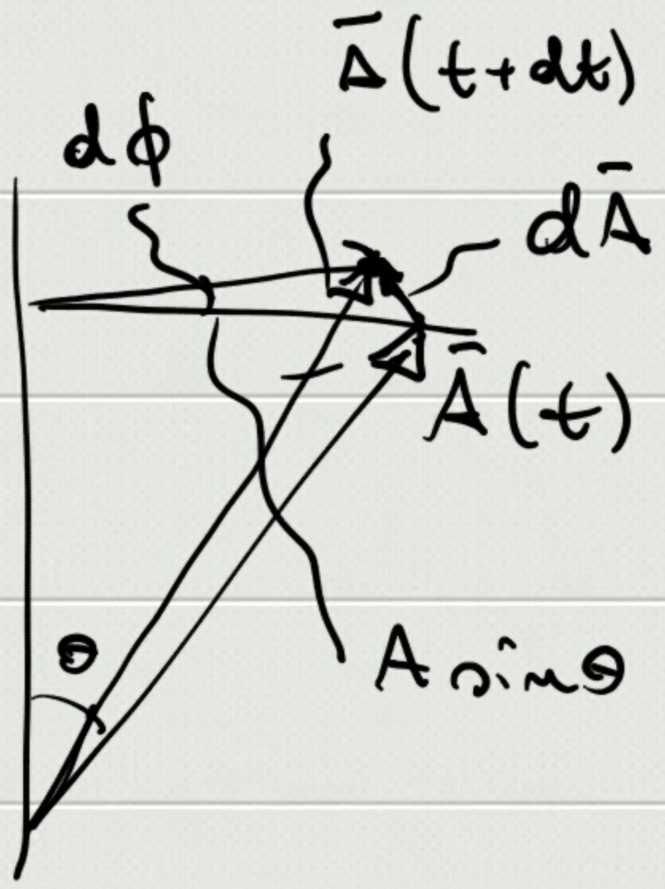
$$\bar{L}_0 = L_{0,z}\,\bar{u}_z + L_{0,\perp}\,\bar{u}_\perp$$



$\omega = \text{cost}$

$\Rightarrow |\bar{L}_0| = \text{cost}$

Moto di precessione



$$dA = A \sin\vartheta \, d\phi$$

$$\frac{dA}{dt} = A \sin\vartheta \frac{d\phi}{dt} =$$

$$= A\omega \sin\vartheta$$

$$\boxed{\frac{d\bar{A}}{dt} = \bar{\omega} \times \bar{A}}$$

$\bar{L}_O$: moto precessione $\quad \bar{\omega} = \text{cost} \Rightarrow$

$$\frac{d\bar{L}_O}{dt} = \bar{\omega} \times \bar{L} \Rightarrow \left| \frac{d\bar{L}_O}{dt} \right| = |\bar{\omega} \times \bar{L}| = \omega L_\perp$$

$$= \bar{M}_O^{\varepsilon} - \cancel{\bar{v}_O \times m \bar{v}_{cm}}$$

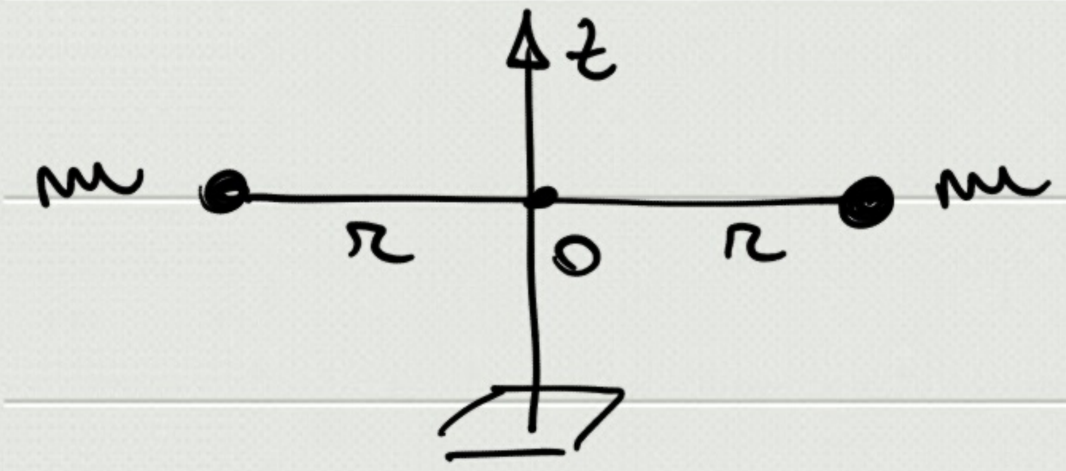
$$= 0$$

$$\boxed{\bar{M}_O^{\varepsilon} = \omega L_\perp}$$

z è asse princ. inerzia $\Rightarrow L_\perp = 0$

z non è asse princ. inerzia $\Rightarrow L_\perp \neq 0$

$$\Rightarrow \boxed{\bar{M}_O^{\varepsilon} \neq 0}$$



$$\sum_i m_i R_i^2$$

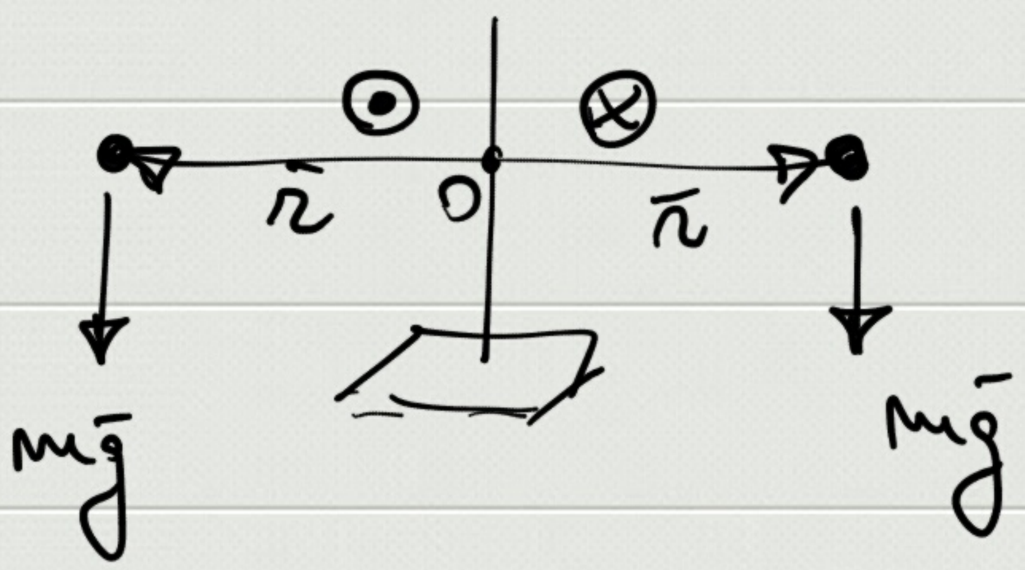
$$I_z = 2mr^2$$

$$\Rightarrow L_z = 2mr^2\omega$$

$$L_\perp = 0$$

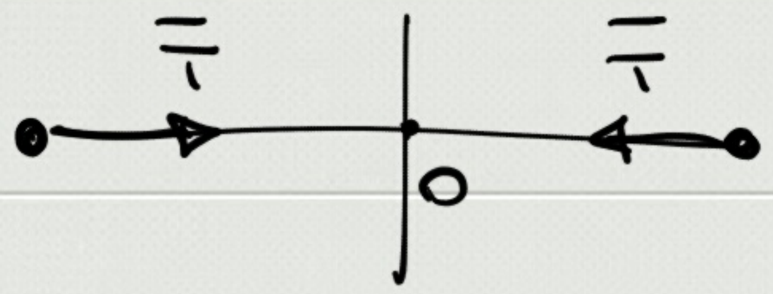
$$\Rightarrow \bar{M}_O^{\varepsilon} = 0$$

$$\frac{d\bar{L}_O}{dt} = \bar{M}_O^{\varepsilon} = 0 \Rightarrow \boxed{\bar{L}_O = \text{cost}}$$

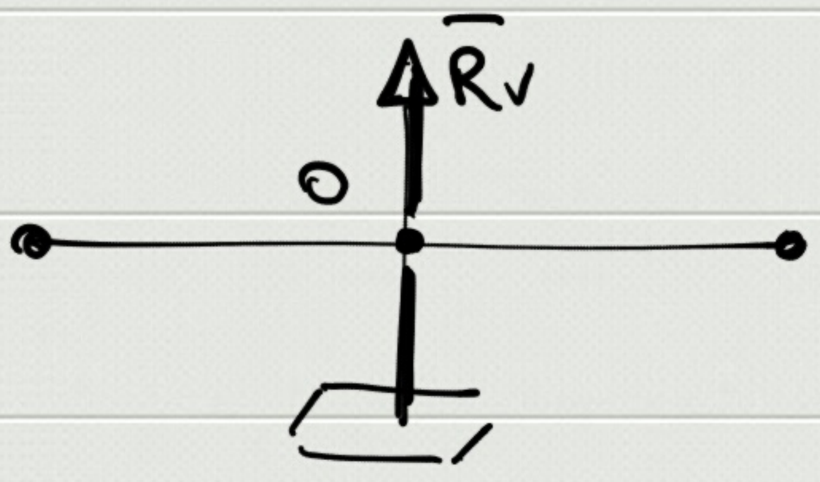


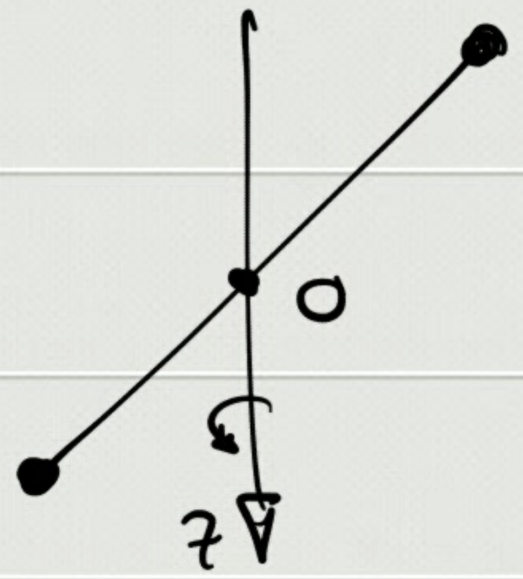
$$\bar{M}_O = \bar{r} \times \bar{F}$$

$$\bar{M}_{peso} = 0$$



$$\bar{M}_{tensioni} = 0$$



$$\bar{M}_{vincolare} = 0$$

$$H_3^e = \omega L_z$$