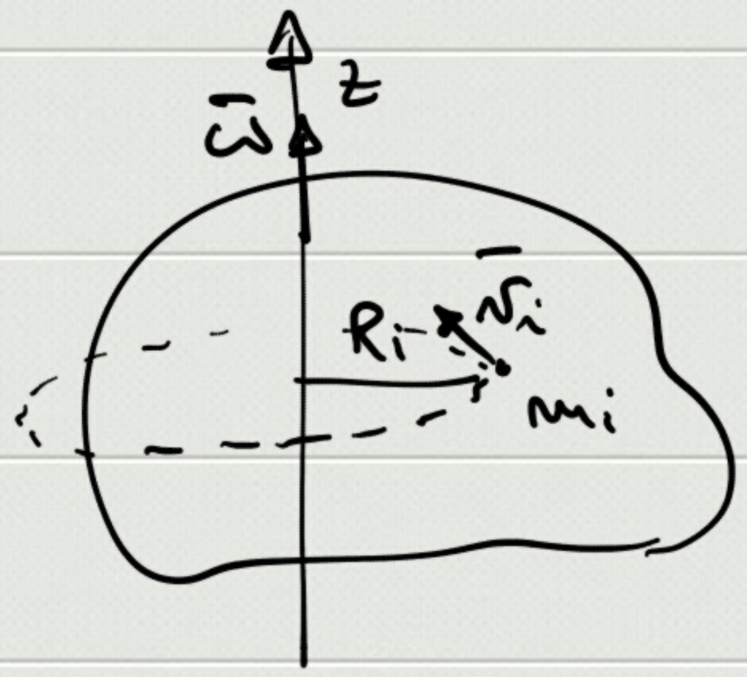
$$E_k = \sum_i E_{k,i} = \sum_i \frac{1}{2} m_i v_i^2 =$$



$$\bar{v}_i = \bar{\omega} \times \bar{R}_i$$

$$= \sum_i \frac{1}{2} m_i \omega^2 R_i^2 = \frac{1}{2} I_z \omega^2$$

$$\boxed{E_k = \frac{1}{2} I_z \omega^2}$$

$$\left(E_k = \frac{1}{2} m v^2\right)$$

z : asse p.i. $\Rightarrow$ $\bar{L} = I_z \bar{\omega}$ $\Rightarrow$ $\omega = \frac{L}{I_z}$

$$\Rightarrow \boxed{E_k = \frac{L^2}{2 I_z}}$$

$$\left(E_k = \frac{p^2}{2m}\right)$$

z NO asse p.i. $\Rightarrow$ $\boxed{E_k = \frac{L_z^2}{2 I_z}}$

$$\omega_i \to \omega_f \quad \Rightarrow \quad \Delta E_k = W_{i\to f}$$

T. dell' energia cinetica $\boxed{W_{i\to f} = \Delta E_k = \frac{1}{2} I_z \omega_f^2 - \frac{1}{2} I_z \omega_i^2}$

$$dW = dE_k = d\left(\frac{1}{2} I_z \omega^2\right) = \frac{1}{2} I_z \, 2\omega \, d\omega =$$

$$= I_z \frac{d\theta}{dt} d\omega = I_z \, d\theta \frac{d\omega}{dt} = I_z \, d\theta \, \alpha = M^E \, d\theta$$

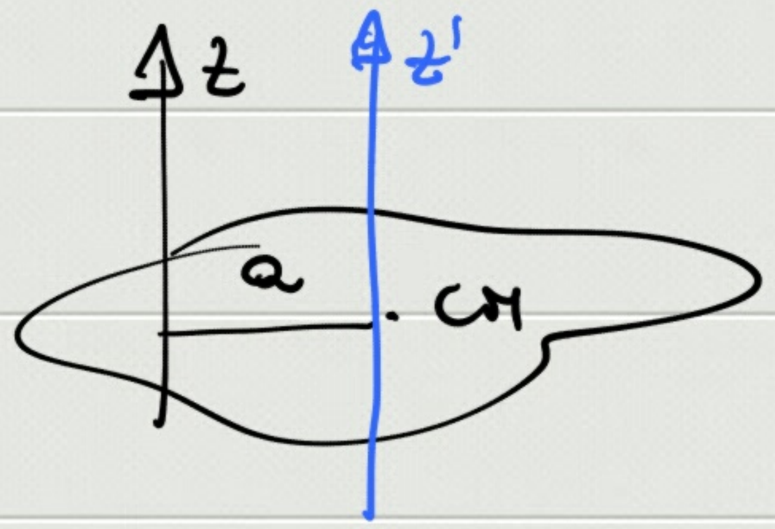
$$dW = M^E d\theta \quad \Rightarrow \quad \boxed{W_{i\to f} = \int_{\theta_i}^{\theta_f} M^E \, d\theta}$$

$$\left[W = \int \bar{F} \, d\bar{s} \right]$$

Potenza

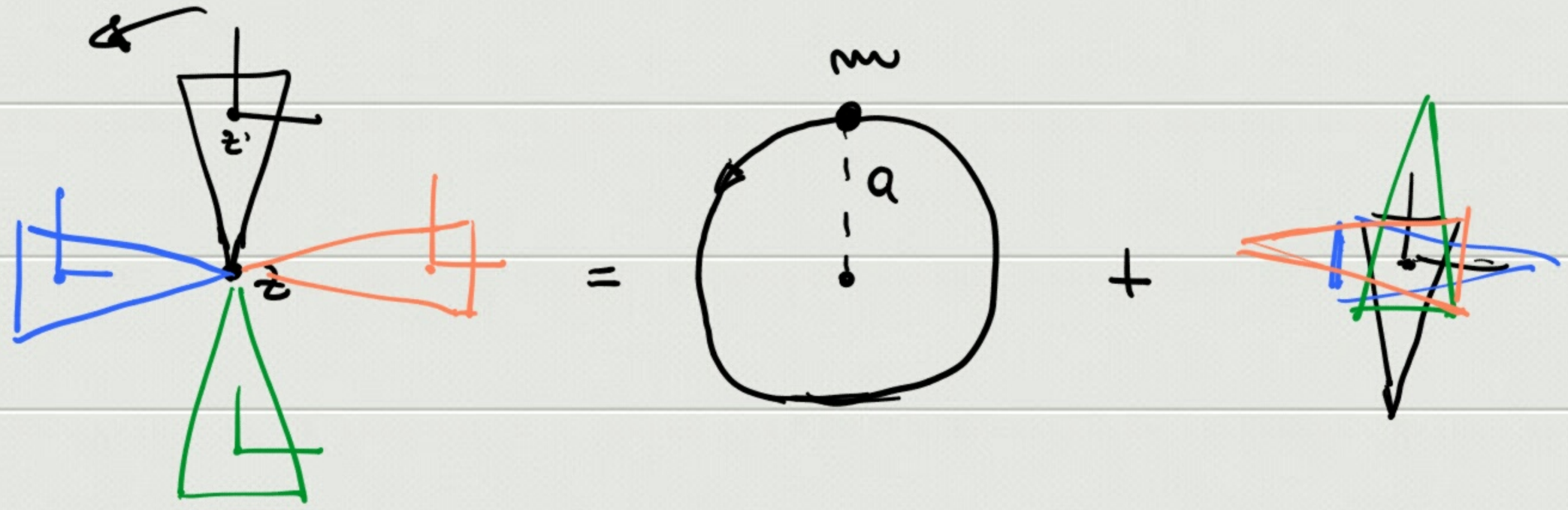
$$P = \frac{dW}{dt} = M^E \frac{d\theta}{dt} = M^E \omega$$

$$\left[P = F v \right]$$



$$E_k = \frac{1}{2} I_z \omega^2 = \frac{1}{2}\left(I_{z'} + m a^2 \right) \omega^2 =$$

$$= \underbrace{\frac{1}{2} I_{z'} \omega^2}_{E_k'} + \frac{1}{2} m \underbrace{a^2 \omega^2}_{v_{CM}^2}$$



$$E_k = E_{k,CM} + E_k'$$