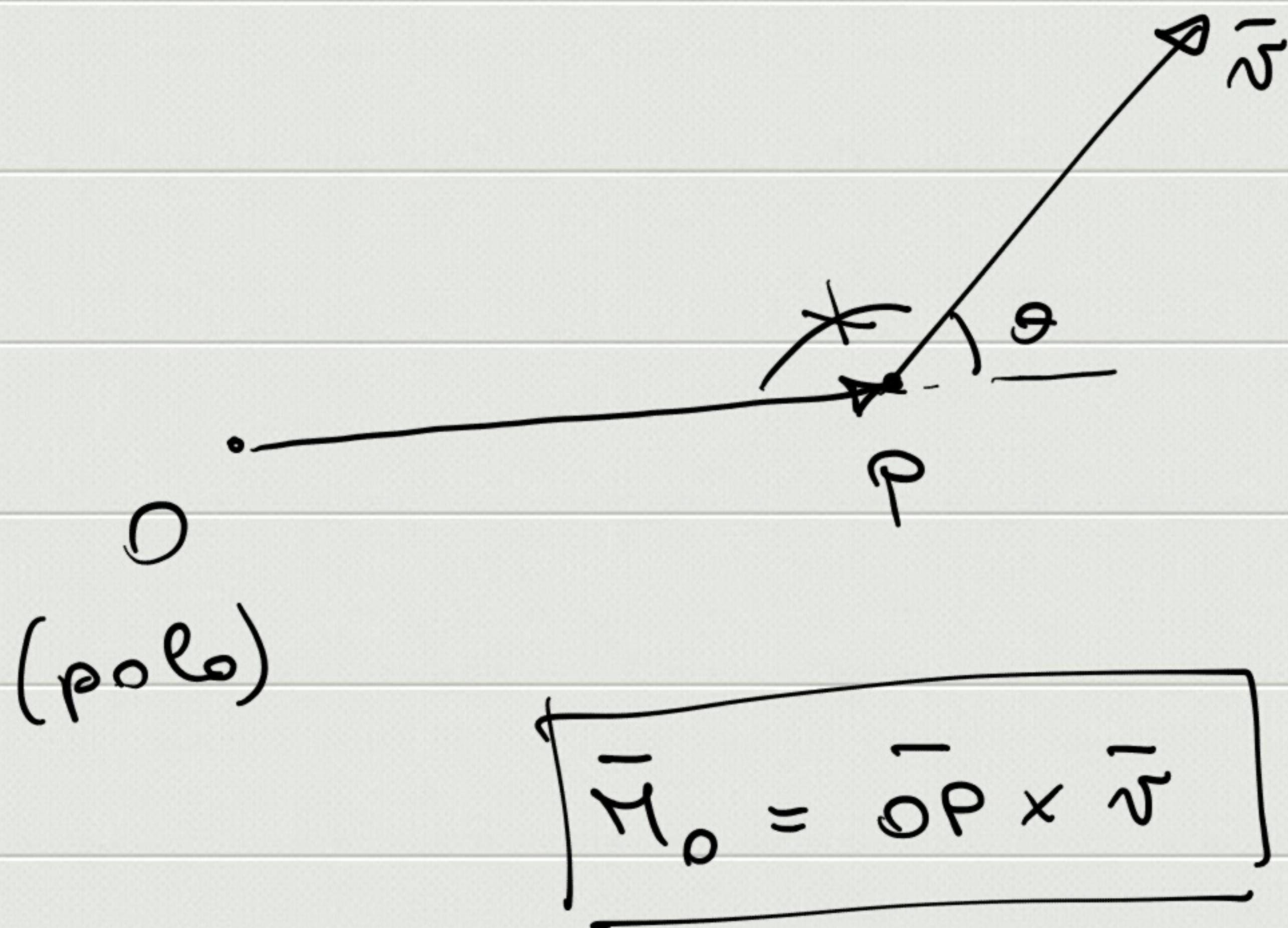


## Momento di un vettore



$$\vec{a} \times \vec{b} = \vec{c}$$

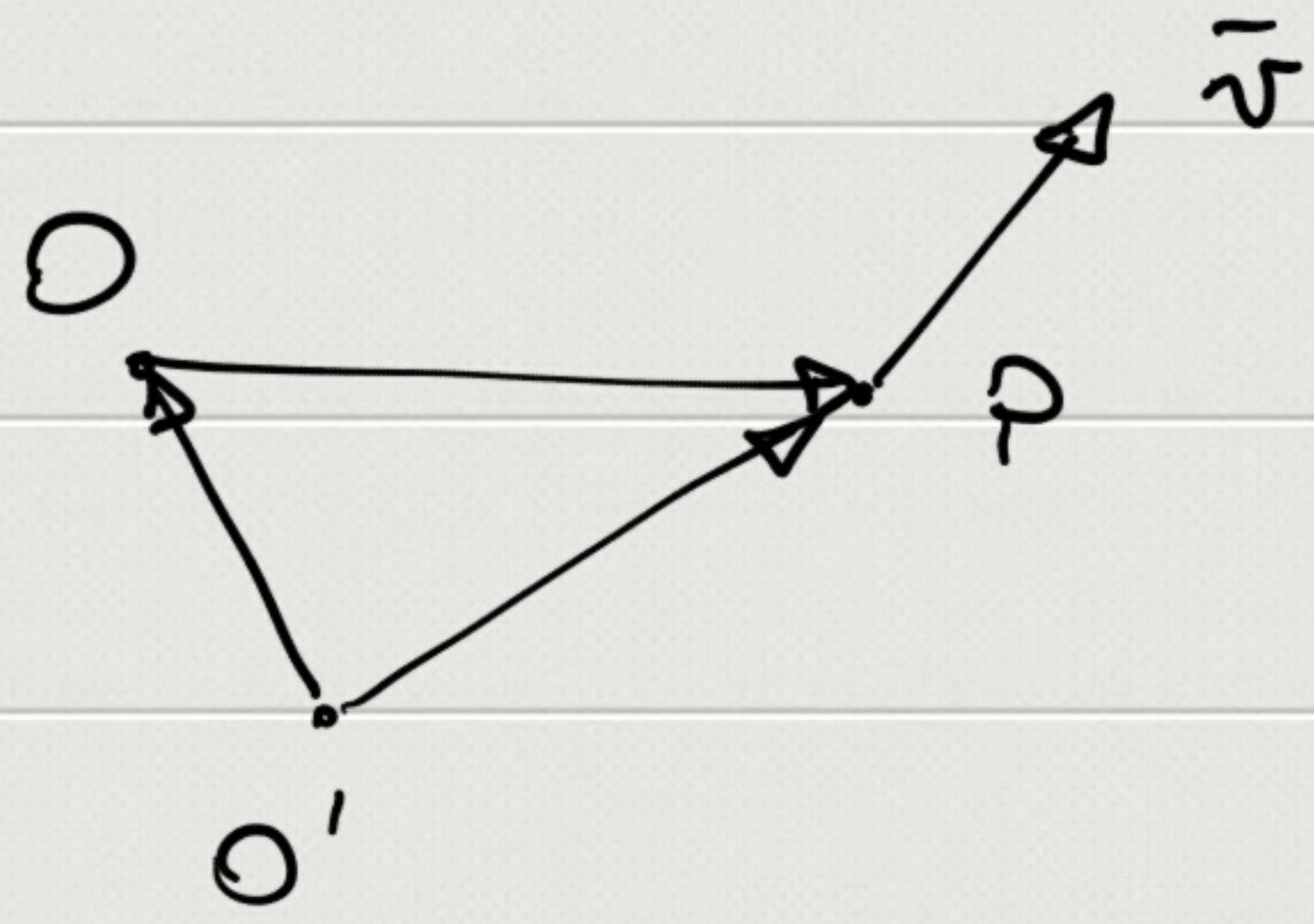
Diagram illustrating the cross product of two vectors  $\vec{a}$  and  $\vec{b}$ , resulting in vector  $\vec{c}$ . The magnitude of  $\vec{c}$  is given by:

$$|\vec{c}| = ab \sin \theta$$

Diagram illustrating the moment of a vector relative to a pole O, with dashed lines indicating perpendicularity and angles  $\theta$  between vectors.

$$|\vec{M}_O| = |\vec{OP}| |\vec{F}| \sin \theta = |\vec{OH}| |\vec{F}|$$

$h$  = braccio



$$\bar{H}_o = \bar{O}P \times \bar{v}$$

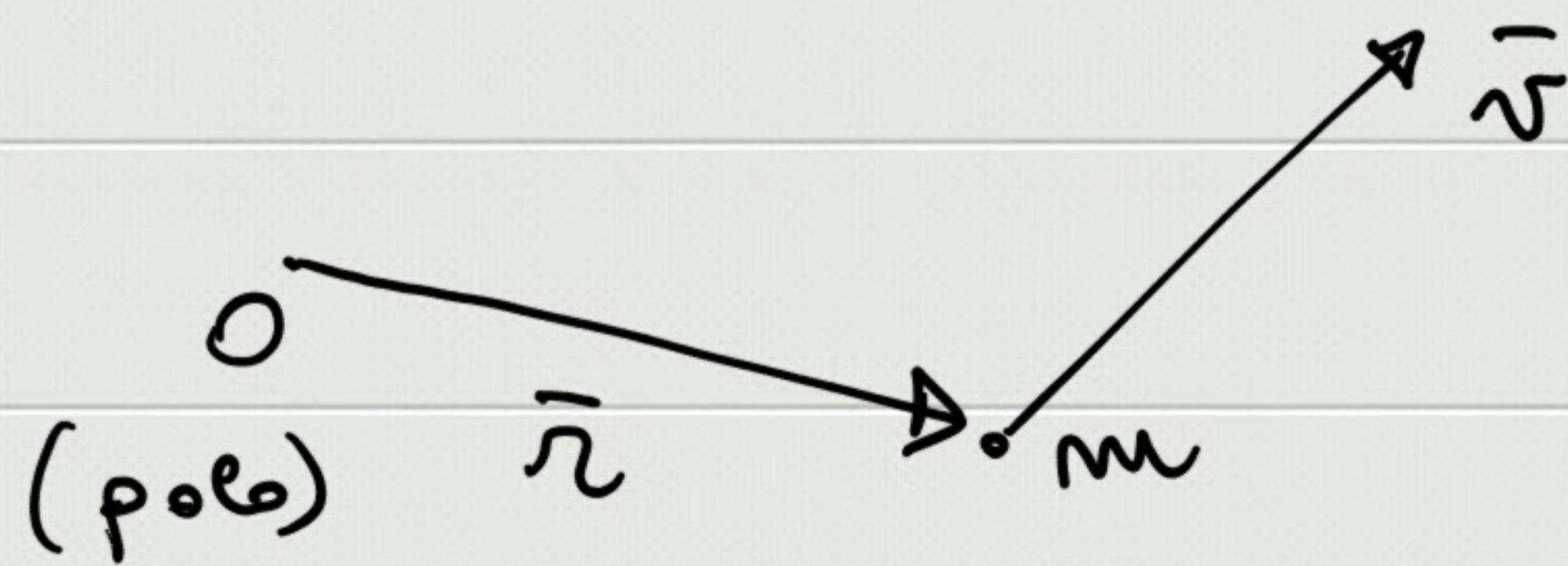
$$\bar{H}_{o'} = \bar{O}'P \times \bar{v} = (\bar{O}'O + \bar{O}P) \times \bar{v} =$$

$$= \bar{O}'O \times \bar{v} + \bar{O}P \times \bar{v} = \bar{O}'O \times \bar{v} + \bar{H}_o$$

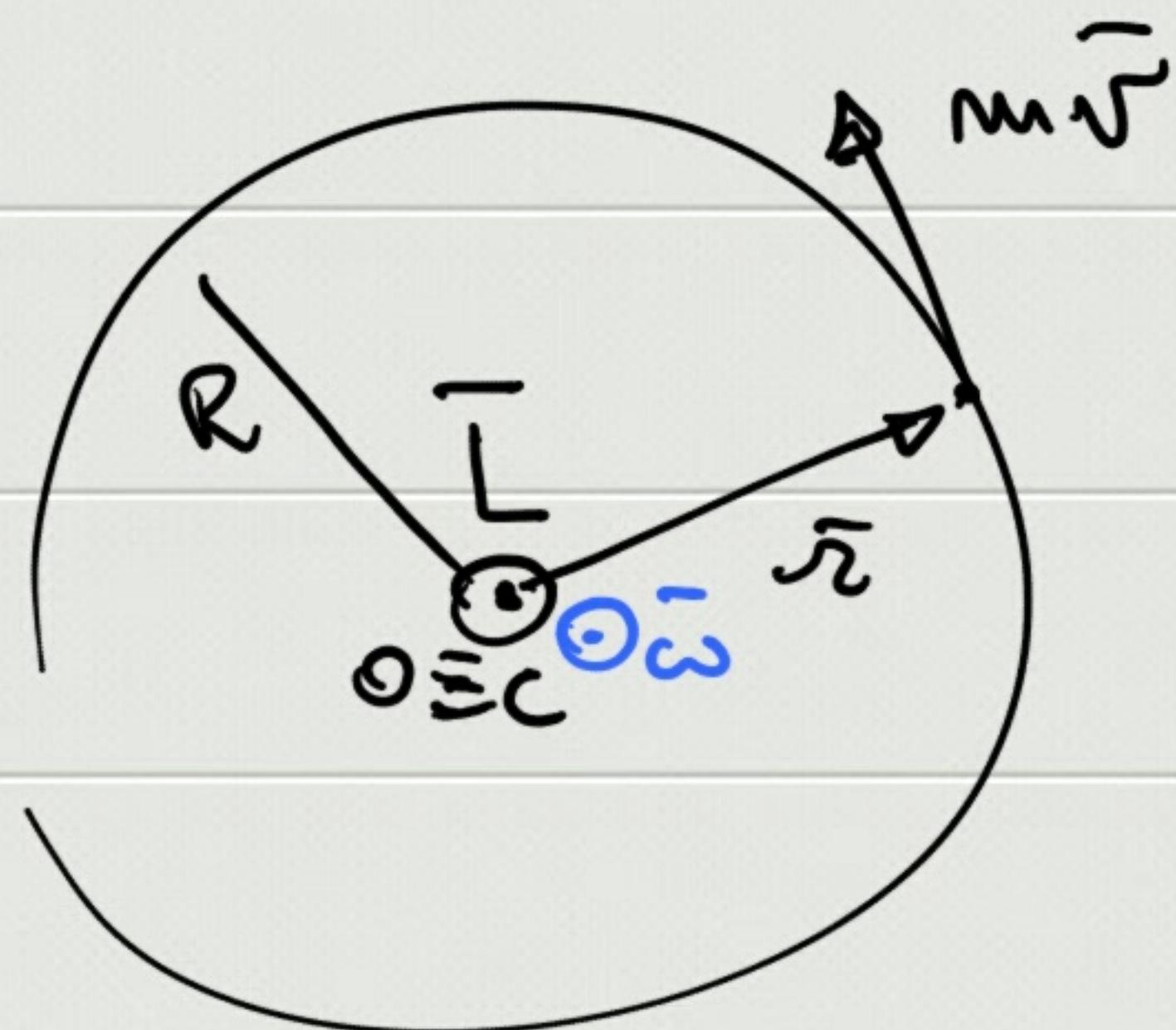
$$\bar{H}_{o'} \neq \bar{H}_o$$

$$\bar{H}_{o'} = \bar{H}_o : \bar{O}'O \times \bar{v} = 0 \quad \bar{O}'O \parallel \bar{v}$$

Momento angolare:  $\boxed{\bar{L} = \bar{r} \times m\bar{v}}$



$$\bar{L}_0 \neq \bar{L}_0' \quad (\bar{o}' \bar{o} \nparallel \bar{v})$$

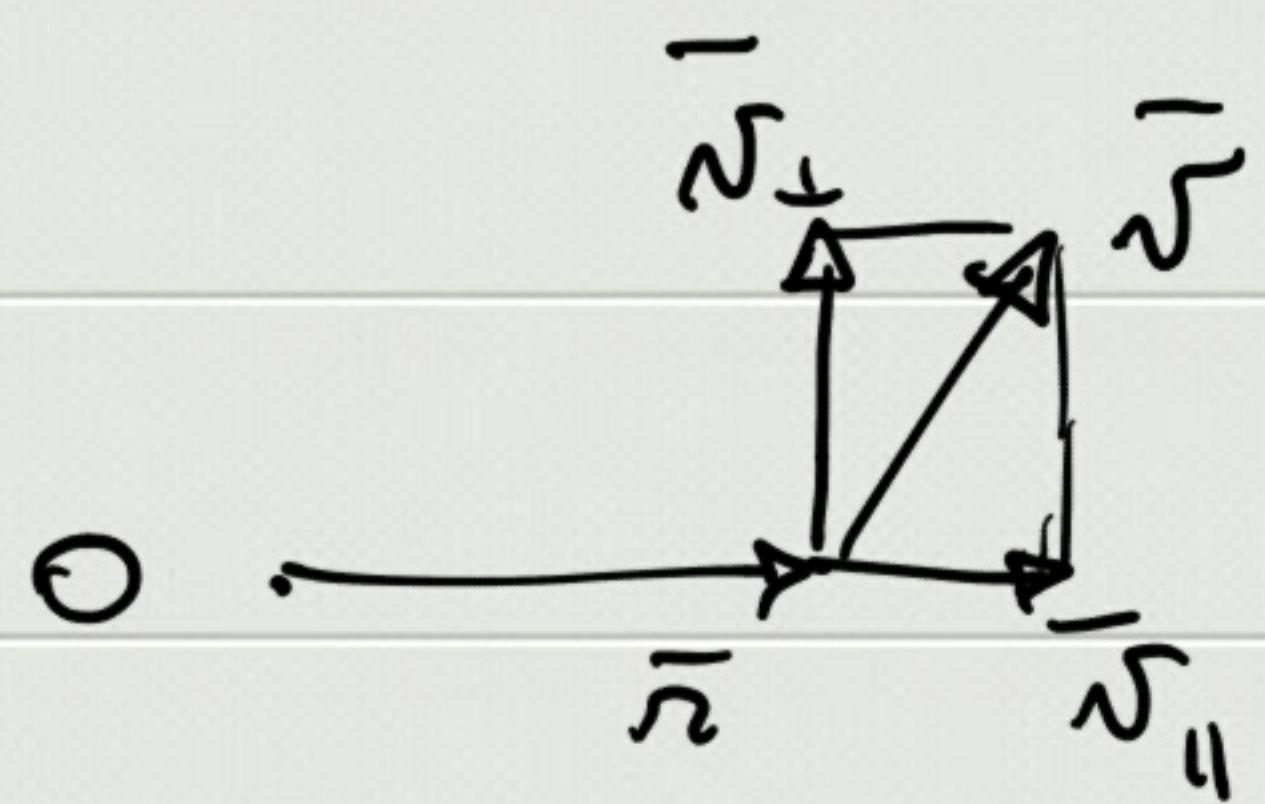


$$\bar{L}_0 = \bar{r} \times m\bar{v}$$

$$\bar{v} = \bar{\omega} \times \bar{r}$$

$$= \bar{r} \times m(\bar{\omega} \times \bar{r})$$

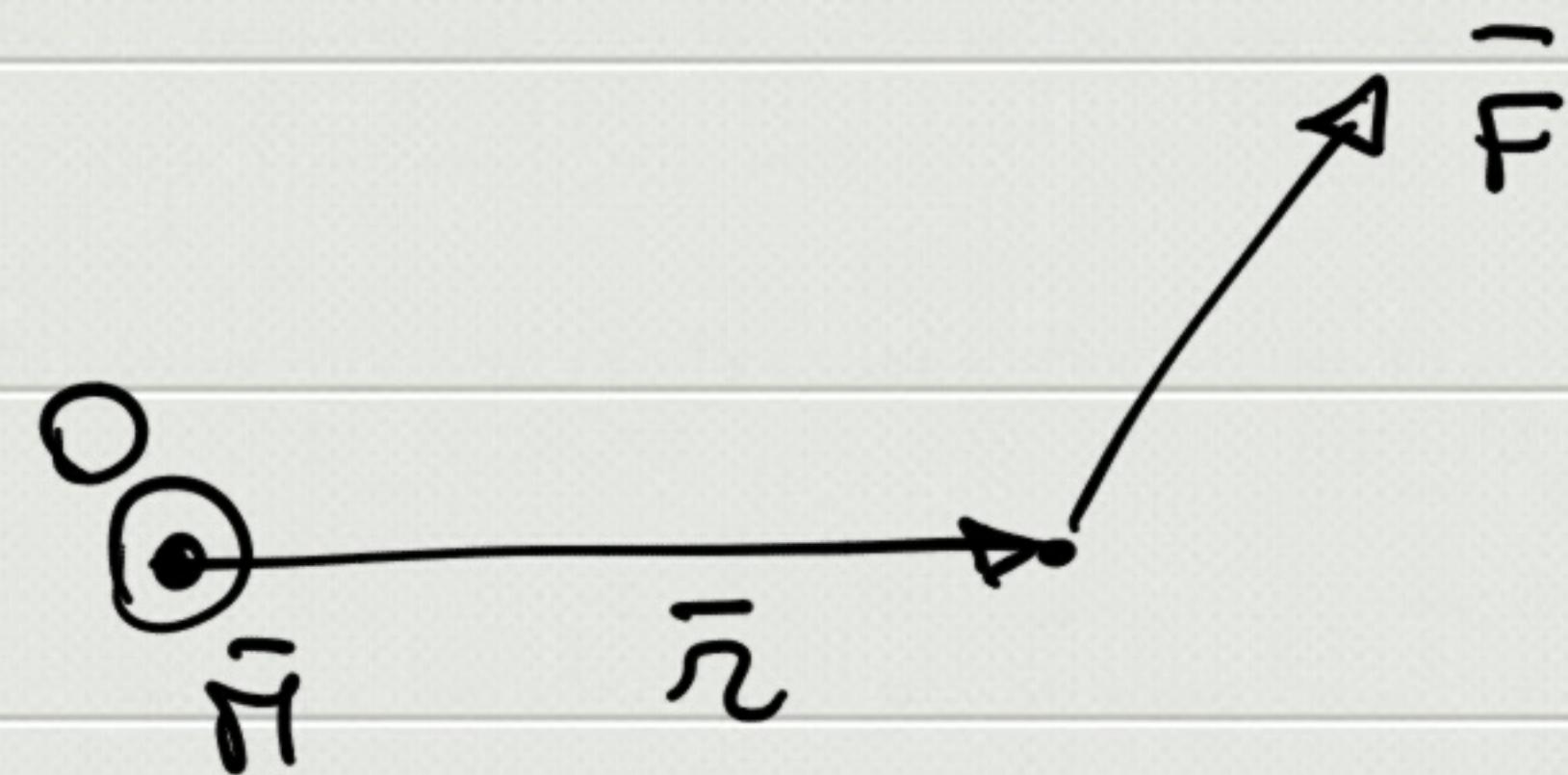
$$= mR^2\omega \bar{v}_\omega = mR^2\bar{\omega}$$



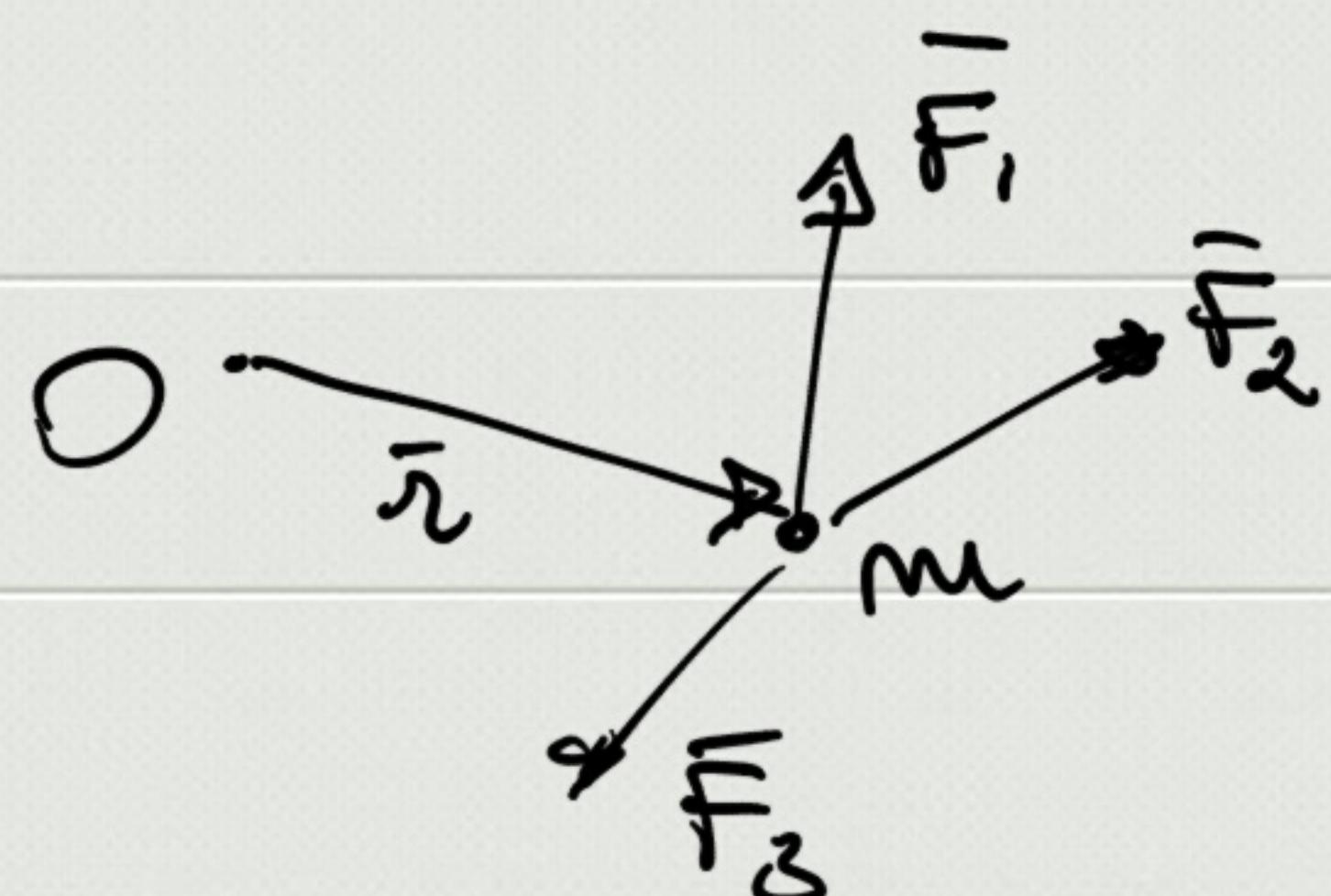
$$\bar{L}_0 = \bar{r} \times m\bar{v} =$$

$$= \bar{r} \times m(\bar{v}_{||} + \bar{v}_\perp) = \bar{r} \times m\bar{v}_\perp$$

Momento di una forza:  $\bar{M}_0 = \bar{r} \times \bar{F}$



$$\bar{M}_0' \neq \bar{M}_0$$



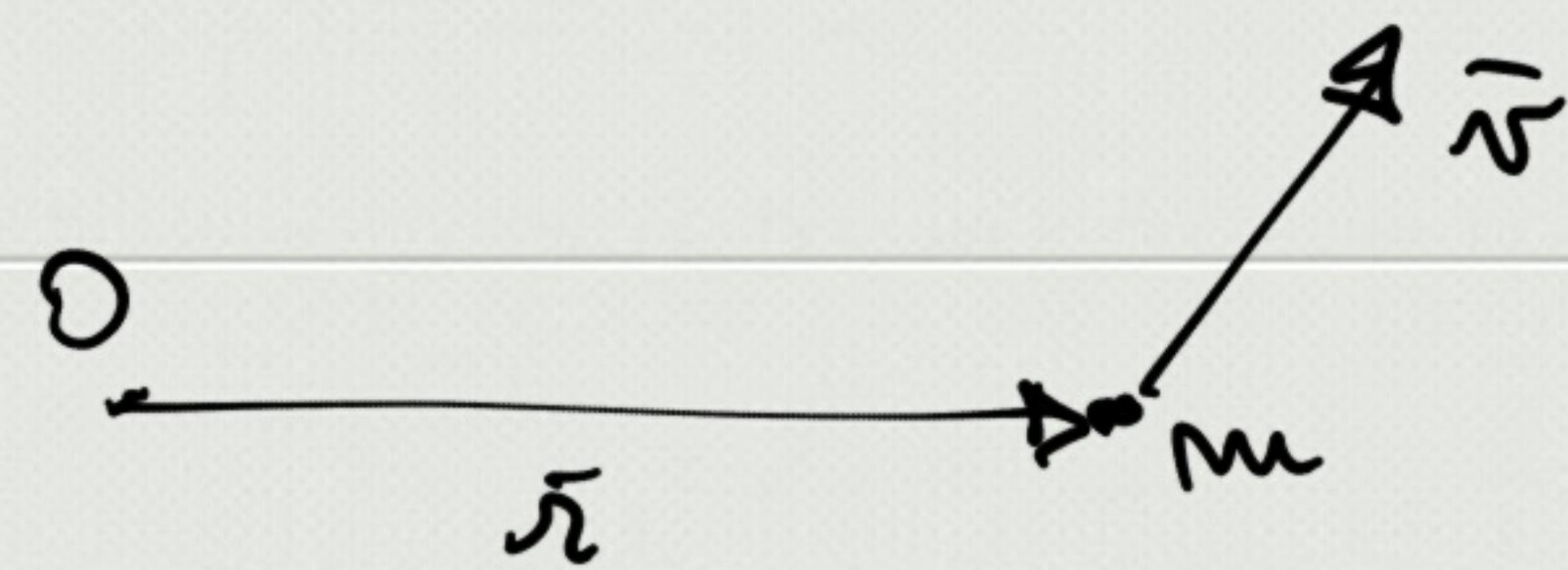
$$\begin{aligned}\bar{M}_{\text{tot},0} &= \sum_i \bar{M}_i = \bar{r} \times \bar{F}_1 + \bar{r} \times \bar{F}_2 + \dots = \\ &= \bar{r} \times (\bar{F}_1 + \bar{F}_2 + \dots) = \bar{r} \times \sum_i \bar{F}_i = \bar{r} \times \bar{R}\end{aligned}$$

$$[\bar{M}] = [F \cdot l] = N \text{ m}$$

$$[L] = [l \text{ m s}] = \frac{\text{kg m}^2 \text{s}^{-1}}{\text{l}} = \text{Nm s}$$

$$\text{N} = \text{kg m s}^{-2}$$

$$\frac{d\bar{L}_o}{dt} = \frac{d}{dt} (\bar{r} \times m\bar{v}) = \frac{d\bar{r}}{dt} \times m\bar{v} + \bar{r} \times m \frac{d\bar{v}}{dt} =$$



$$0 \text{ fermo } (\bar{v}_o = 0) \Rightarrow \frac{d\bar{r}}{dt} = \bar{v}$$

$$= \cancel{\bar{v} \times m \bar{v}} + \bar{r} \times m \bar{a} = \bar{r} \times \bar{F} = \bar{M}_o$$

T. del momento angolare per un punto

$$\boxed{\frac{d\bar{L}_o}{dt} = \bar{M}_o}$$

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

$$\bar{v}$$

$$\frac{d}{dt}$$

$$\bar{a}$$

$$\bar{p} = m\bar{v}$$

"

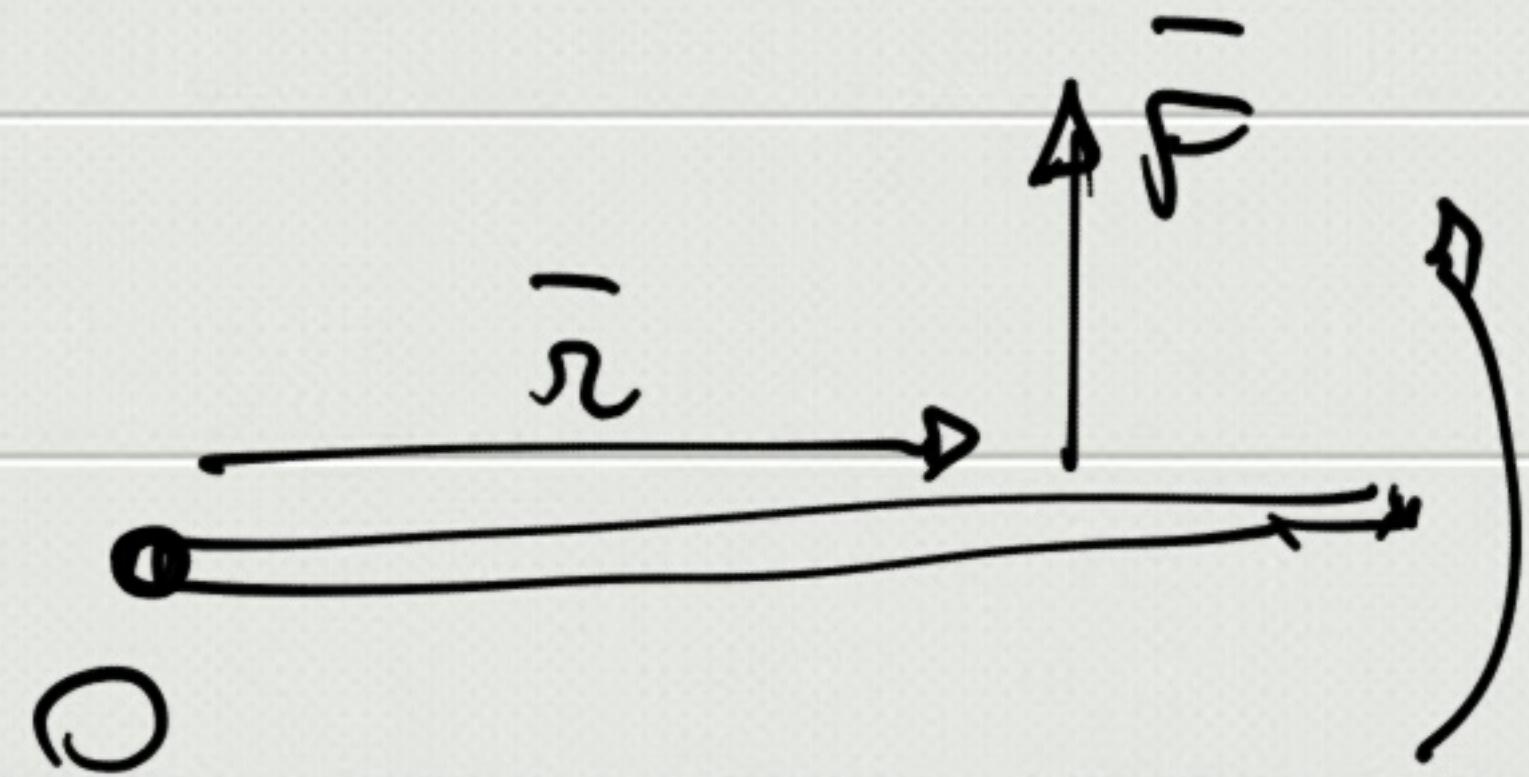
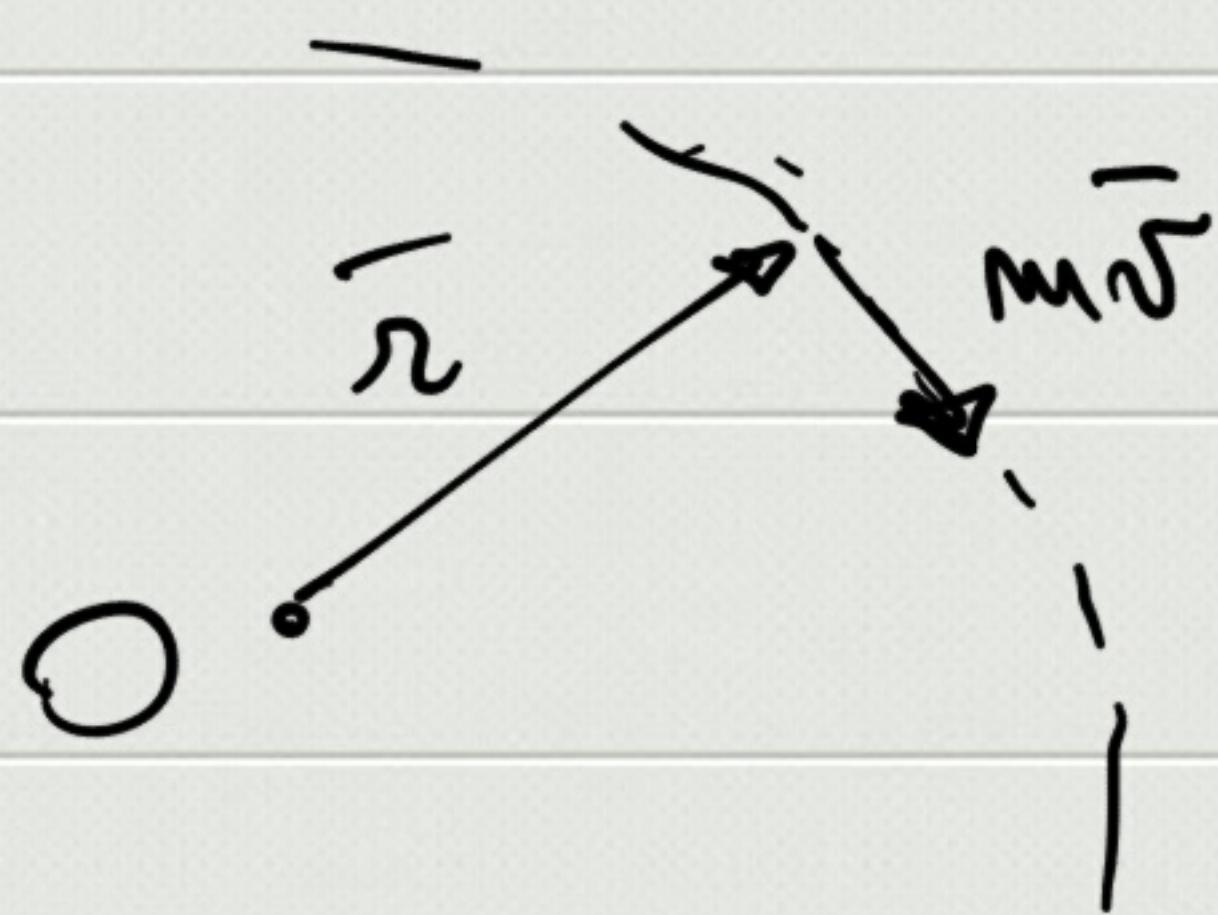
$$\bar{F} = m\bar{a}$$

$$\bar{L}_o = \bar{r} \times m\bar{v}$$

"

$$\bar{M}_o = \bar{r} \times m\bar{a}$$

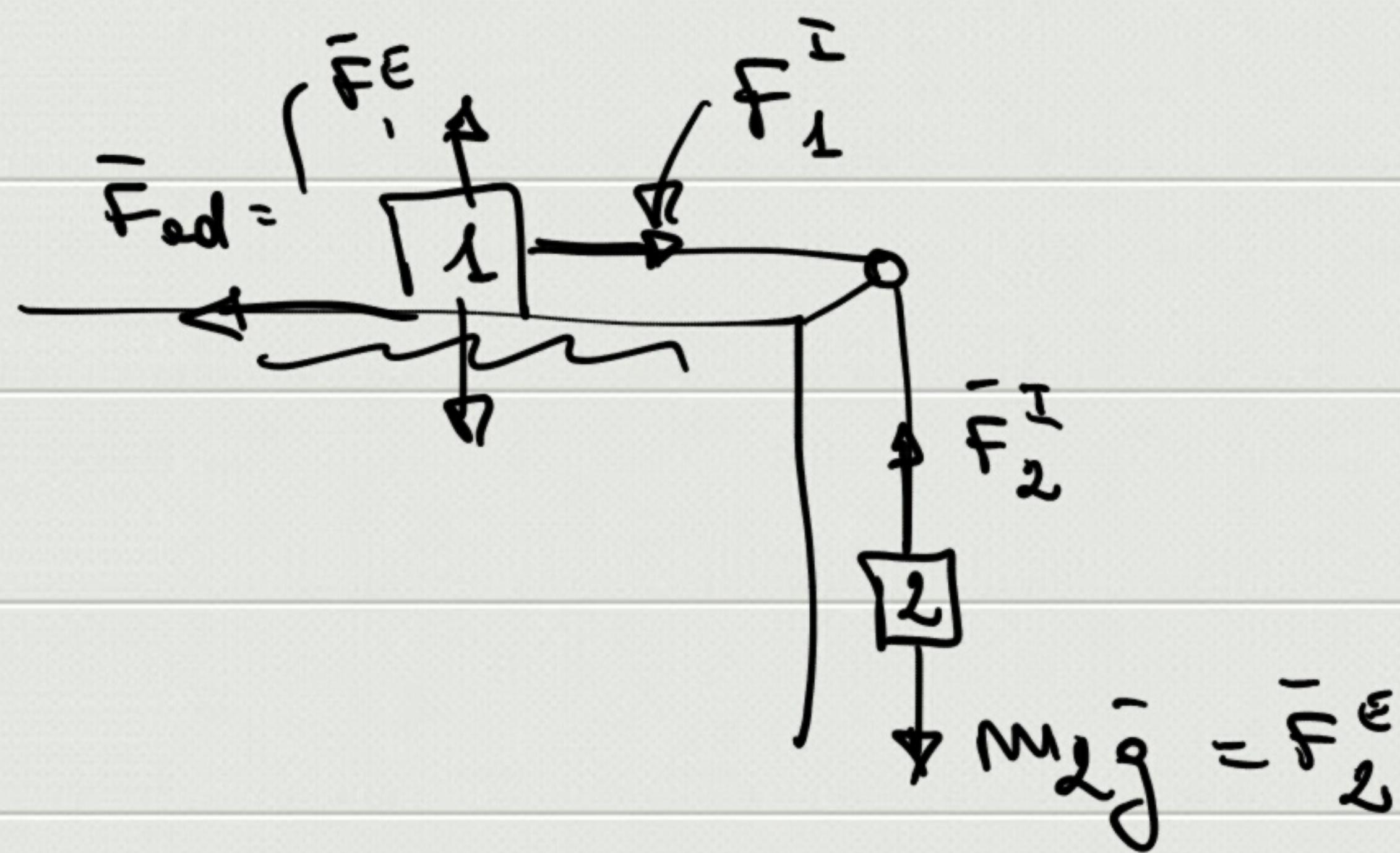
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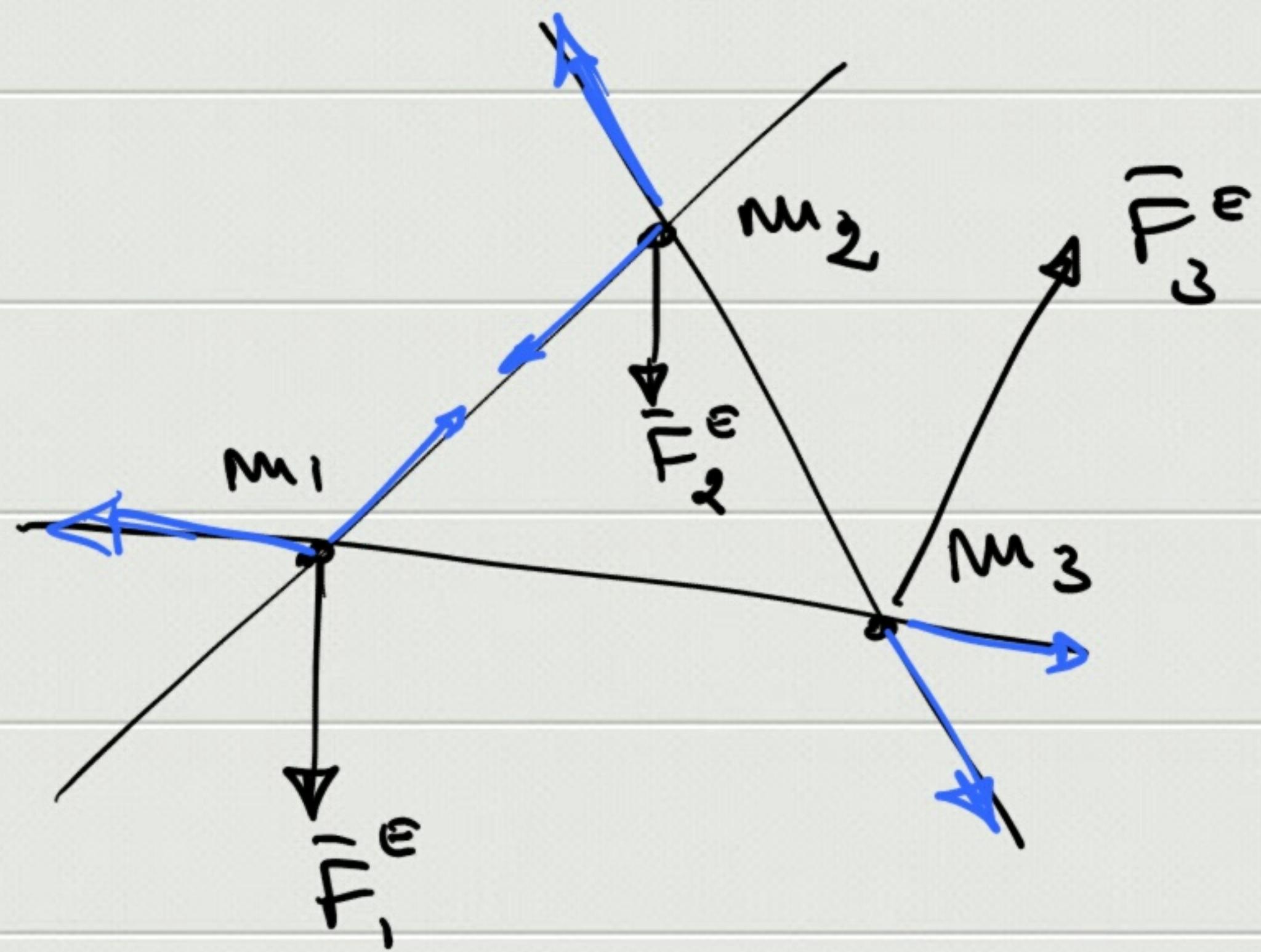


Sisteme di punti materiali

Mi

$$\bar{F}_i = \bar{F}_i^I + \bar{F}_i^E$$





$$\bar{F}_{ij} = -\bar{F}_{ji}$$

$$\bar{R}^I = \sum_i \bar{F}_i^I = \sum_i \left( \sum_{j \neq i} \bar{F}_{ji} \right) = 0$$

$$\bar{P} = \sum_i \bar{p}_i = \sum_i m_i \bar{v}_i$$

$$\bar{L}_o = \sum_i \bar{L}_{i,o} = \sum_i (\bar{r}_i \times m_i \bar{v}_i)$$

$$E_K = \sum_i E_{K,i} = \sum_i \frac{1}{2} m_i v_i^2$$