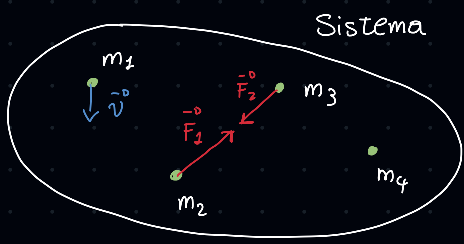
1) $\vec{F} = m \cdot \vec{a}$

2) $\vec{M} = \dfrac{d\vec{L}}{dt}$



$$\vec{F}_{TOT} = \sum_i \vec{F}_i \begin{cases} \text{Forze interne} \rightarrow \sum_i \vec{F}_{inT} \\ \text{Forze esterne} \rightarrow \sum_i \vec{F}_{ext} \end{cases}$$

masse

$\hookrightarrow M_{TOT} = \sum_i m_i \quad , \quad \vec{a}_{TOT} = \sum_i \vec{a}_i$

$$\Rightarrow \sum_i \vec{F}_{inT} + \sum_i \vec{F}_{ext} = \boxed{\sum_i m_i \vec{a}_i} \rightarrow \frac{d\vec{v}}{dt}$$

$$\rightarrow \sum_i m_i \cdot \frac{d\vec{v}}{dt}$$

$\vec{p} = m \cdot \vec{v} \Rightarrow d\vec{p} = m\, d\vec{v}$

$$\boxed{\vec{P}_{TOT} = \sum_i m_i \vec{v}_i}$$

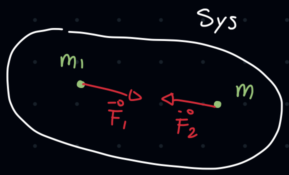
$$\Rightarrow \boxed{\sum_i \vec{F}_{inT} + \sum_i \vec{F}_{ext} = \frac{d\vec{P}_{TOT}}{dt}}$$

I° eq card generalizz.

$$\boxed{\sum_i \vec{M}_{int} + \sum_i \vec{M}_{ext} = \frac{d\vec{L}}{dt}}$$

II° eq card generalizz.

Forze interne



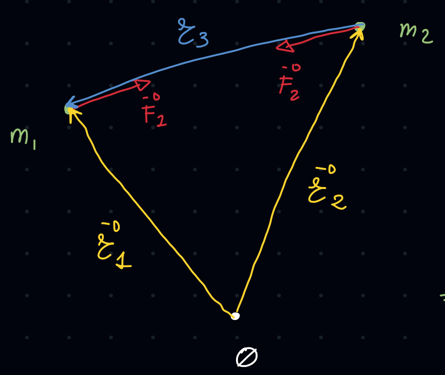
Per il principio di Azione - Reazione $\rightarrow \vec{F}_1 = -\vec{F}_2 \quad \Rightarrow \underline{\sum_i \vec{F}_{int} = 0}$

Momenti interni

$\sum_i \vec{M}_{int} = 0$ TESI

$$\vec{r}_1 - \vec{r}_2 = \vec{r}_3$$

$$\vec{r}_1 = \vec{r}_2 + \vec{r}_3 \quad , \quad \vec{F}_1 = -\vec{F}_2$$



$$\vec{M}_1 + \vec{M}_2 = \vec{r}_1 \wedge \vec{F}_1 + \vec{r}_2 \wedge \vec{F}_2 = \vec{r}_1 \wedge (-\vec{F}_2) + \vec{r}_2 \wedge \vec{F}_2$$

$$= (\vec{r}_1 - \vec{r}_2) \wedge \vec{F}_2 = \cancel{\vec{r}_3 \wedge \vec{F}_2}\ 0$$

$\vec{r}_3 \parallel \vec{F}_2$

$$\Rightarrow \vec{M}_1 + \vec{M}_2 = \emptyset \quad \underline{\text{QED}}$$

Aggiorniamo le equazioni

1) $\cancel{\sum_i \vec{F}_{INT}} + \sum_i \vec{F}_{ext} = \frac{d\vec{P}_{TOT}}{dt} \rightarrow \sum_i \vec{F}_{ext} = \frac{d\vec{P}_{TOT}}{dt}$

2) $\cancel{\sum_i \vec{M}_{int}} + \sum_i \vec{M}_{ext} = \frac{d\vec{L}}{dt} \rightarrow \sum_i \vec{M}_{ext} = \frac{d\vec{L}}{dt}$

In un sys isolato $\rightarrow$ $\vec{M}_{ext} = 0$, $\vec{F}_{ext} = \emptyset$

$$\left\{\begin{array}{l} \frac{d\vec{P}_{TOT}}{dt} = 0 \\ \frac{d\vec{L}}{dt} = 0 \end{array}\right\}$$ $\vec{P}$ e $\vec{L}$ sono costanti nel tempo $\Rightarrow$ SI CONSERVANO!