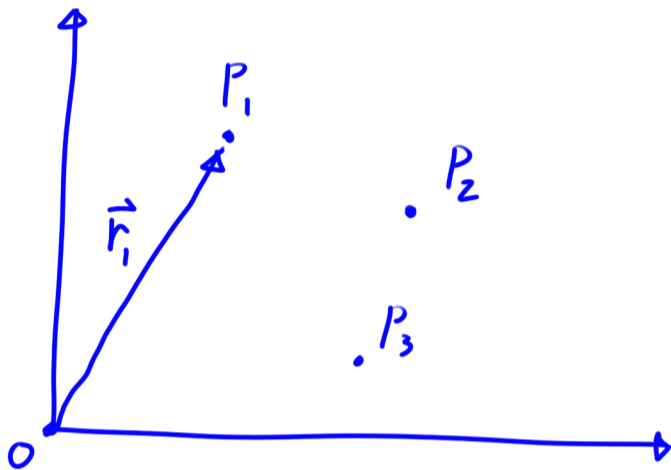


Systems of Particles

$$\vec{F} = m \vec{a} \quad \text{single particle}$$

$$\vec{F}_i + \sum_{j=1}^n \vec{f}_{ij} = m_i \vec{a}_i$$

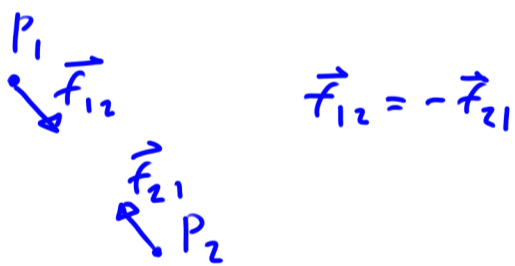
\vec{F}_i external force on P_i
 \vec{f}_{ij} force on P_i from P_j



Moments about O

$$\vec{r}_i \times \vec{F}_i + \sum_{j=1}^n \vec{r}_i \times \vec{f}_{ij} = \vec{r}_i \times m_i \vec{a}_i$$

Identities



$$\sum_{i=1}^n \sum_{j=1}^n \vec{f}_{ij} = \vec{0}$$

$$\sum_{i=1}^n \sum_{j=1}^n \vec{r}_i \times \vec{f}_{ij} = \vec{0}$$

$$\sum_{i=1}^n \vec{F}_i = \sum_{i=1}^n m_i \vec{a}_i$$

$$\sum_{i=1}^n \vec{r}_i \times \vec{F}_i = \sum_{i=1}^n \vec{r}_i \times m_i \vec{a}_i$$

Motion of mass center

$$m \vec{F} = \sum_{i=1}^n m_i \vec{r}_i$$

\vec{r} location of mass center

m total system mass

\vec{a} acceleration of mass center

$$\sum_{i=1}^n \vec{F}_i = m \vec{a}$$