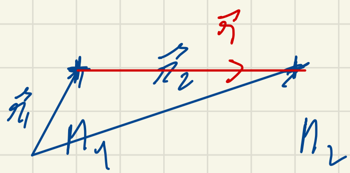
Problème à deux corps



$$m_1 \ddot{\vec r}_1 = + \frac{m_1 m_2 G}{r^3} \vec r$$

$$m_2 \ddot{\vec r}_2 = - \frac{m_1 m_2 G}{r^3} \vec r$$

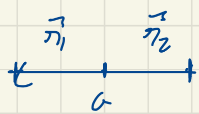
$\vec r = \vec r_2 - \vec r_1$

donc $m_1 \ddot{\vec r}_1 + m_2 \ddot{\vec r}_2 = 0$

cad $\dot{\vec{OG}} = \vec{cste}$: le ref barycentrique est galiléen : on se place dans ce ref.

on note $\vec r_1 = \vec{GM_1}$

$\vec r_2 = \vec{GM_2}$



$\vec r = \vec r_2 - \vec r_1$ et $\ddot{\vec r} = \ddot{\vec r}_2 - \ddot{\vec r}_1 = \left(- \frac{m_1 G}{r^3} - \frac{m_2 G}{r^3} \right) \vec r$

d'où $$\ddot{\vec r} = - \frac{(m_1 + m_2) G}{r^3} \vec r$$

$$\Rightarrow \frac{m_1 m_2}{m_1 + m_2} \ddot{\vec r} = - \frac{m_1 m_2 G}{r^3} \vec r$$

$$\mu \ddot{\vec r} = - \frac{\mu \cdot (m_1 + m_2) G \vec r}{r^3}$$

$+$ m_1+m_2

$+$ μ

sol° circulaire : $\vec{v} = r\dot{\theta}\,\vec{e_\theta}$

$\vec{a} = -r\dot{\theta}^2\,\vec{e_r}$

$$a = \frac{v^2}{R}$$

$$a = \frac{(m_1+m_2)G}{R^2} = \frac{v^2}{R}$$

donc $v = \sqrt{\frac{(m_1+m_2)G}{R}}$

$$T = \frac{2\pi R}{v}$$

$$= 2\pi R \cdot \sqrt{\frac{R}{m}}$$

$$\boxed{T = 2\pi\sqrt{\frac{R^3}{(m_1+m_2)G}}}$$

$$T = \sqrt{\frac{4\pi^2 R^3}{(m_1+m_2)G}}$$

3ème ppe

$$\dot{\vec{p}}_1 = \vec{F}_{2\to 1} + \vec{F}_{ext\to 1}$$

$$\dot{\vec{p}}_2 = \vec{F}_{1\to 2} + \vec{F}_{ext\to 2}$$

$p_1 + p_2$