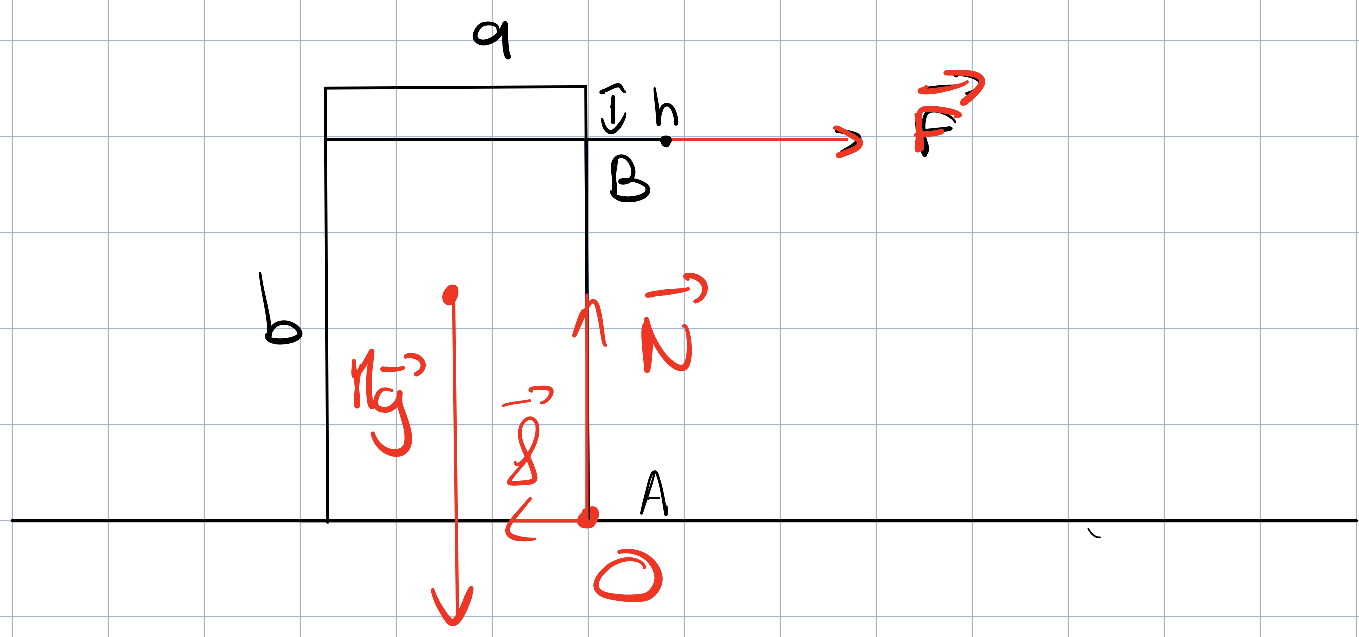
1



Moment de force
(par rapport à l'origine O)

$$\vec{M}_O = \vec{r} \wedge \vec{F}$$

On pose l'origine au point A

$$\vec{F} + M\vec{g} + \vec{f} + \vec{N} = \vec{0}.$$

On a que :

$\ominus$ "va vers nous"

$$M_A(\vec{f}) + M_A(\vec{F}) + M_A(m\vec{g}) + M_A(\vec{N})$$

$$= \cancel{\vec{f} \wedge \vec{AA}}_{=\vec{0}} + \vec{AB} \wedge \vec{F}$$

$$+ \vec{AG} \wedge m\vec{g} + \cancel{\vec{N} \wedge \vec{AA}}_{=\vec{0}}$$

$$= (b-h) \cdot F \cdot \sin\left(\frac{-\pi}{2}\right) \hat{e}_z$$

$$+ \frac{a}{2} \cdot \sin\left(\frac{\pi}{2}\right) \cdot mg\, \hat{e}_z$$

$$\left\{ -(b-h) \cdot F + \frac{a}{2} mg = 0 \right.$$

$$\Leftrightarrow (-b+h) \cdot F = -\frac{a}{2} mg$$

e) $F = \dfrac{-a\ mg}{2(-b+h)}$

$$= \frac{a\,mg}{2(b-h)}$$

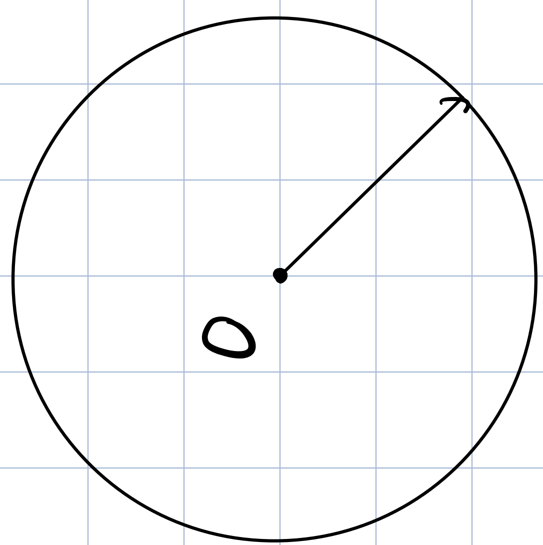
2

a

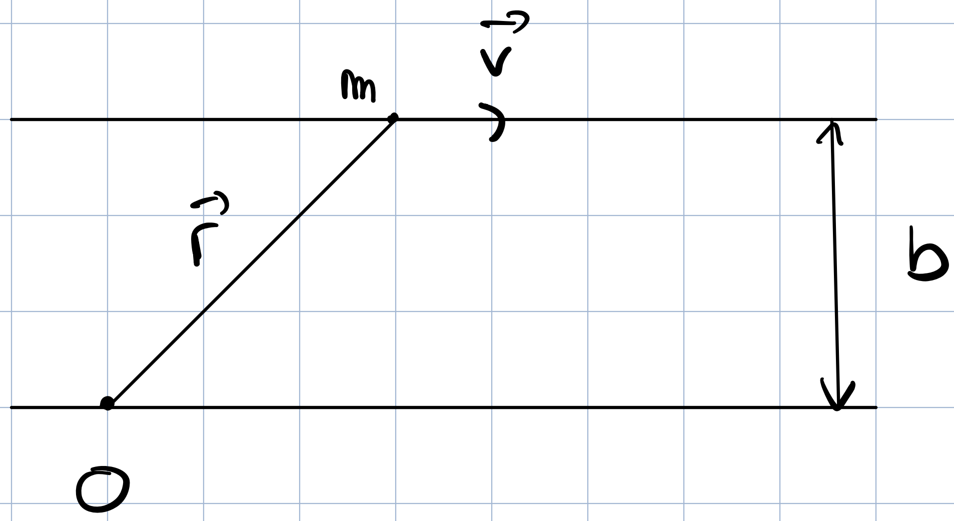
Théorème du moment cinétique

$$\frac{d\vec{L_O}}{dt} = \vec{M_O} = \underbrace{\vec{r} \wedge \vec{F}}_{0}$$

$= 0$ si force centrale



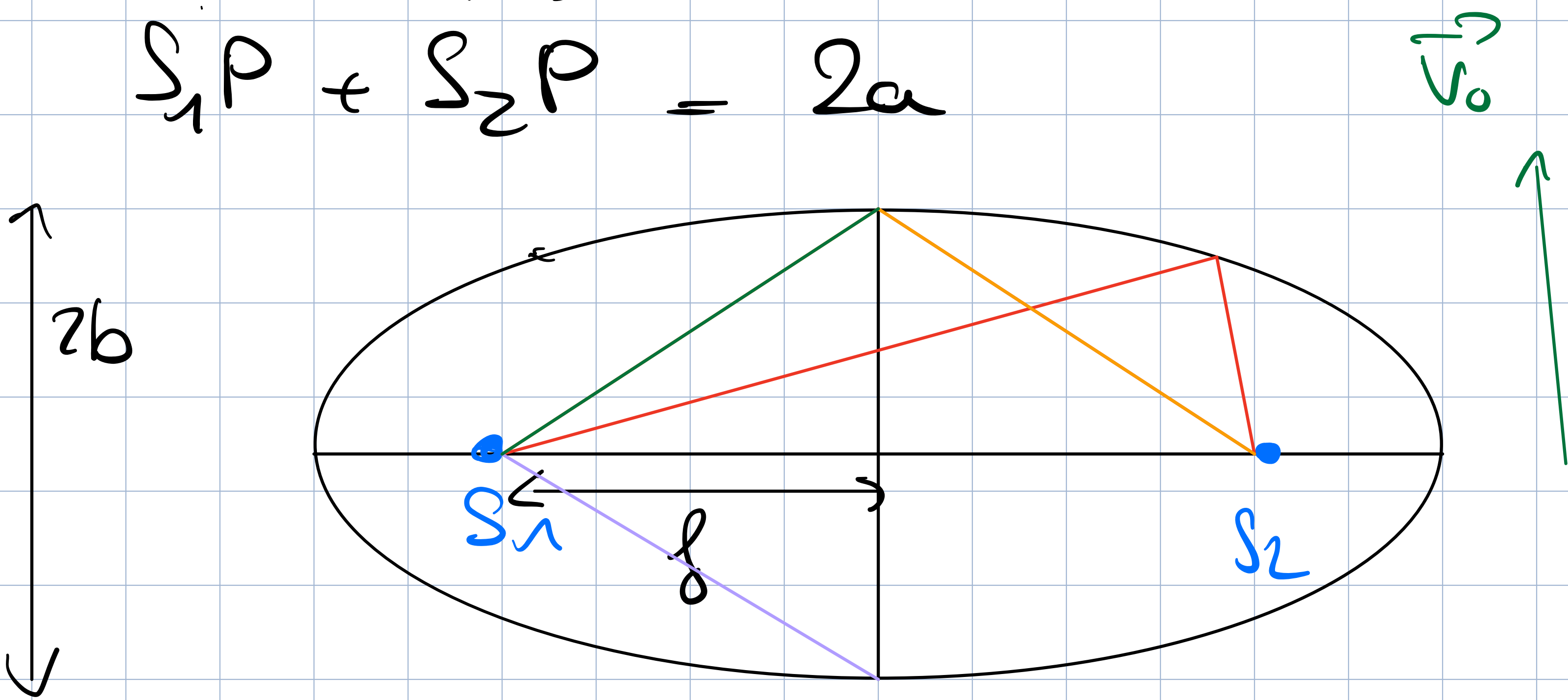
$$\vec{L_O} = m\underbrace{\vec{r} \wedge \vec{v}}_{0}$$



$$\frac{d\vec{L}_O}{dt} = \vec{\Gamma}_O = \underbrace{\vec{r} \wedge \vec{F}}_{\vec{0}}$$

③ $\dfrac{T^2}{a^3} = \underline{\text{cste}}$

$$\overline{S_1P} + \overrightarrow{S_2P} = 2a$$



$$f^2 + b^2 = \left(\frac{2a}{2}\right)^2$$

$$= a^2.$$

$$f = \sqrt{a^2 - b^2}$$

$$\vec{L}_{S_1} = \text{cste.}$$

$$\vec{M}_{S_1} = \vec{r} \wedge \vec{F}_{grav} = \vec{0}$$

$$\dot{\vec{L}}_{S_1} = \vec{M}_{S_1} = \vec{0}$$

$$\Leftrightarrow \quad \vec{L}_{S_1} = \underbrace{\vec{r} \wedge m\vec{v}} = \underline{\text{cste}}$$

$$(a + \ell)\, m\, v_0 = (a - \ell)\, m\, v_1$$

$$= \left(\sqrt{\ell^2 + b^2}\right)$$