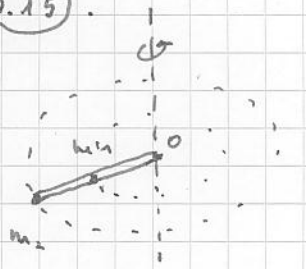
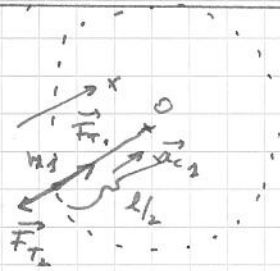
5.15



i). Plaçons-nous en m_1 :



vu de dessus

$\Sigma \vec{F} = \vec{F}_{T_1} + \vec{F}_{T_2} = m_1 \vec{a}_{c_1} \Rightarrow$ sur x : $F_{T_1} - F_{T_2} = m_1 a_{c_1}$ (1)

$a_{c_1} = \frac{v_1^2}{l/_2}$ (2)

Comme $F_{T_2} = \frac{F_{T_1}}{2} \Rightarrow \frac{F_{T_1}}{2} = m_1 a_{c_1}$ (*)

ii). Plaçons-nous en m_2 :

$\Sigma \vec{F} = \vec{F}_{T_2} = m_2 \vec{a}_{c_2}$

sur x : $F_{T_2} = m_2 a_{c_2} \Rightarrow \frac{F_{T_1}}{2} = m_2 a_{c_2}$ (**)

$a_{c_2} = \frac{v_2^2}{l}$

Or, (*) = (**) $\Rightarrow m_1 a_{c_1} = m_2 a_{c_2} \Rightarrow \frac{m_2}{m_1} = \frac{a_{c_1}}{a_{c_2}} = \frac{v_1^2}{l/_2} \cdot \frac{1}{v_2^2} = \frac{v_1^2}{2 v_2^2}$

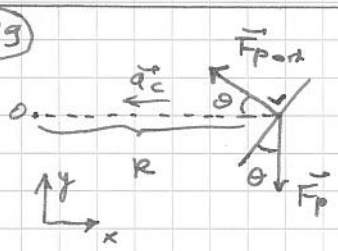
iii). Relation entre les vitesses :

La période est identique pour les 2 masses : $T = \frac{2\pi\, l/_2}{v_1} = \frac{2\pi l}{v_2} \Rightarrow \frac{v_2}{v_1} = \frac{2\pi l}{\pi l_2} = 2$

$\Rightarrow \left(\frac{v_2}{v_1}\right)^2 = 4$ et $\left(\frac{v_1}{v_2}\right)^2 = \frac{1}{4}$

$\Rightarrow \frac{m_2}{m_1} = 1/2 = 0{,}5$

5.19



Cinématique :

$a_c = \frac{v^2}{R} = \frac{123^2}{3810} \simeq 3{,}97\ m/s^2$ (A)

$m = 200'000\ kg$

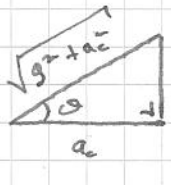
Dynamique : $\Sigma \vec{F} = m \vec{a}_c = \vec{F}_{port} + \vec{F}_p$

sur x : $-F_{port} \cos\theta = -m a_c \Rightarrow F_{port} \cos\theta = m a_c$ (1)

sur y : $-F_p + F_{port} \sin\theta = 0 \Rightarrow F_{port} \sin\theta = F_p$ (2)

$\frac{(2)}{(1)} = \tan\theta = \frac{g}{a_c} \Rightarrow \theta = \text{Arctg}\left(\frac{g}{a_c}\right)$

$\Rightarrow$ de (2) : $F_{port} = \frac{F_p}{\sin\theta} = \frac{mg}{\sin\left(\text{Arctg}\frac{g}{a_c}\right)} = \frac{mg \cdot \sqrt{g^2 + a_c^2}}{g} = m\sqrt{g^2 + a_c^2} \simeq 2{,}11 \cdot 10^6\ N$



$\Rightarrow \sin\theta = \frac{g}{\sqrt{g^2 + a_c^2}}$