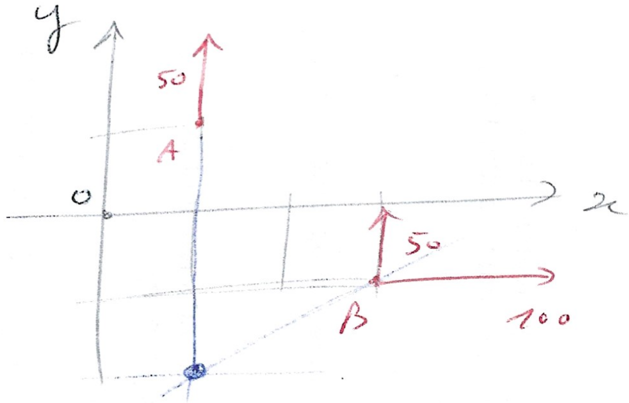
Correction DS de SI, MPSI 1, juin 22

Exo 1

$$\{T_{F_A+F_B}\} = \begin{Bmatrix} 100\vec{x} + 100\vec{y} \\ 300\vec{z} \end{Bmatrix}_O$$



Support : droite $y = x - 3$

Exo 2

Pour un train epy : $\dfrac{\omega_{C/PS}}{\omega_{P/PS}} = -\dfrac{Z_P}{Z_C}$

On cherche $\dfrac{\omega_{PS/C}}{\omega_{P/C}} = \dots = \dfrac{Z_P}{Z_C + Z_P} = \dfrac{6}{19}$

Rapport global : $r = \left(\dfrac{6}{19}\right)^2 \times \dfrac{5,3}{26,3} = 0,02$

Exo 3

(Q1) Solide (S) soumis à 2 forces $\Rightarrow \dots \Rightarrow$

(Q2) $pS = F_{45} \cos\beta \Rightarrow F_{45} = \dfrac{pS}{\cos\beta}$

(Q3) $\vec{CB} \wedge F_{45}\,\vec{x_4} + \vec{CK} \wedge F_a \cdot \vec{y_5} = \vec{0}$

$h\,\vec{y_5} \wedge F_{45}\,\vec{x_4} + c\,\vec{x_5} \wedge F_a \cdot \vec{y_5} = \vec{0}$

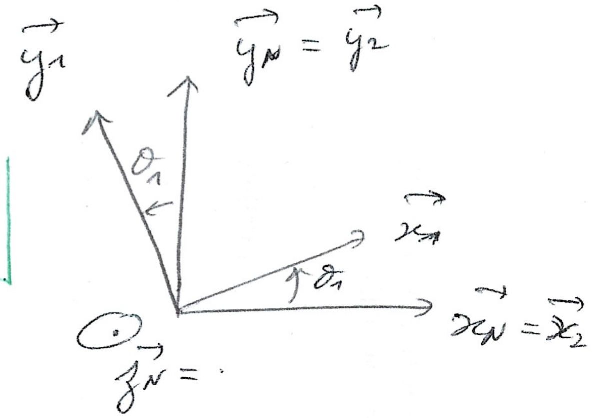
$\vec{y_5} = \cos(\alpha-\beta)\,\vec{y_4} - \sin(\alpha-\beta)\,\vec{x_4}$

$\Rightarrow -h\,F_{45}\cos(\alpha-\beta) + c \cdot F_a = 0 \Rightarrow$

$$\frac{h\,p\,S \cos(\alpha-\beta)}{\cos\beta} = c\,F_a$$

$$\Rightarrow p = \frac{c\,F_a \cos\beta}{h\,S\cos(\alpha-\beta)}$$

② **Exo 1** Quille



Q1 $\{\mathcal{T}_{N\to1}\} = \begin{Bmatrix} X & L \\ Y & M \\ Z & 0 \end{Bmatrix}_{O \text{ ds } B_N}$

$\{\mathcal{T}_{pes\to1}\} = \begin{Bmatrix} 0 & 0 \\ -mg & 0 \\ 0 & 0 \end{Bmatrix}_{G \text{ dans } B_N}$

$\vec{M}_{pes}(O) = \vec{M}_{pes}(G) + \vec{OG} \wedge -mg\,\vec{y_N}$

$= -L_1\,\vec{y_1} \wedge -mg\,\vec{y_N} = -mg\,L_1 \sin\theta_1\,\vec{z_N}$

$\{\mathcal{T}_{pes\to1}\} = \begin{Bmatrix} 0 & 0 \\ -mg & 0 \\ 0 & -mg\,L_1 \sin\theta_1 \end{Bmatrix}_{O \text{ dans } B_N}$

$\{\mathcal{T}_{verin\to1}\} = \begin{Bmatrix} F_{21} & 0 \\ 0 & 0 \\ 0 & 0 \end{Bmatrix}_{A_2 \text{ dans } B_N}$

$\vec{M}_{verin}(O) = \vec{M}_{verin}(A_2) + \vec{OA_2} \wedge F_{21}\,\vec{x_N}$

$= (R\,\vec{y_1} - d\,\vec{z_N}) \wedge F_{21}.\vec{x_N} = -F_{21}\,R\cos\theta_1\,\vec{z_N}$

$- F_{21}.d.\vec{y_N}$

$\{\mathcal{T}_{verin\to1}\} = \begin{Bmatrix} F_{21} & 0 \\ 0 & -F_{21}\,d \\ 0 & -F_{21}.R\cos\theta_1 \end{Bmatrix}_{O \text{ dans } B_N}$

On isole 1, on applique le PFS $\Rightarrow$

$$\left|\begin{array}{l} X + F_{21} = 0 \\ Y - mg = 0 \\ Z = 0 \end{array}\right. \qquad \left|\begin{array}{l} L = 0 \\ M - d F_{21} = 0 \\ -mg\,L_1 \sin\theta_1 - F_{21}\,R\cos\theta_1 = 0 \end{array}\right.$$

$\Longrightarrow$ $X = \ldots$ et $F_{21} = -\dfrac{mg\,L_1 \sin\theta_1}{R\cos\theta_1}$

$Y = \ldots$