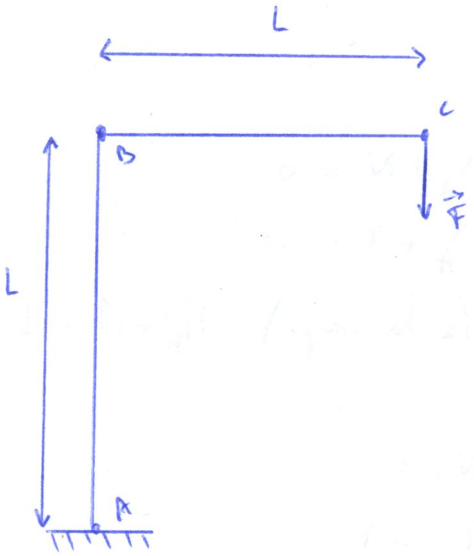
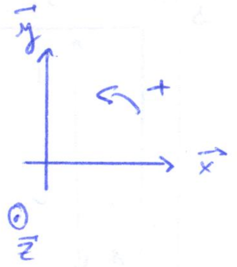
[rdm - 0007]

Portique





① Bilan : → en A : X_A, Y_A, M_A

→ en C : $\vec{F} = -F\vec{y}$

② $h = 3 - 3 \times 1 = 0$ ⟹ Isostatique

encastrement ; 1 poutre

③ PFS :

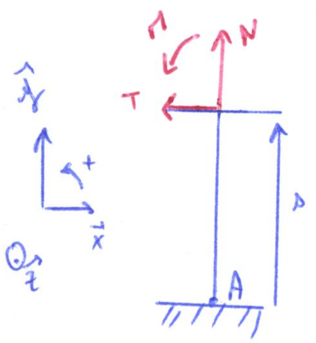
$$\begin{cases} X_A = 0 \\ Y_A - F = 0 \\ \text{(en A)} : M_A - FL = 0 \end{cases}$$

Donc

$$\begin{cases} X_A = 0 \\ Y_A = F \\ M_A = FL \end{cases}$$

④ 2 coupes

⑤ 1ère coupe : $0 \leq s \leq L$

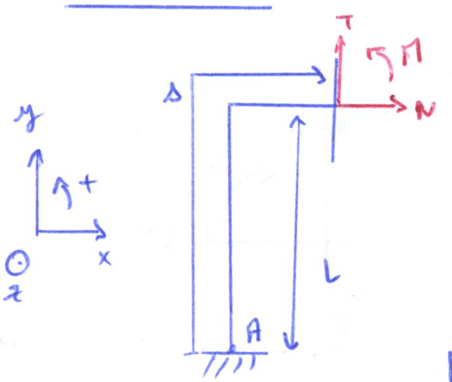


$$\begin{cases} X_A - T = 0 \\ Y_A + N = 0 \\ \text{(à la coupe)} \quad M_A + M + X_A \cdot s = 0 \end{cases}$$

Donc

$$\begin{cases} T = 0 \\ N = -F \\ M = -FL \end{cases}$$

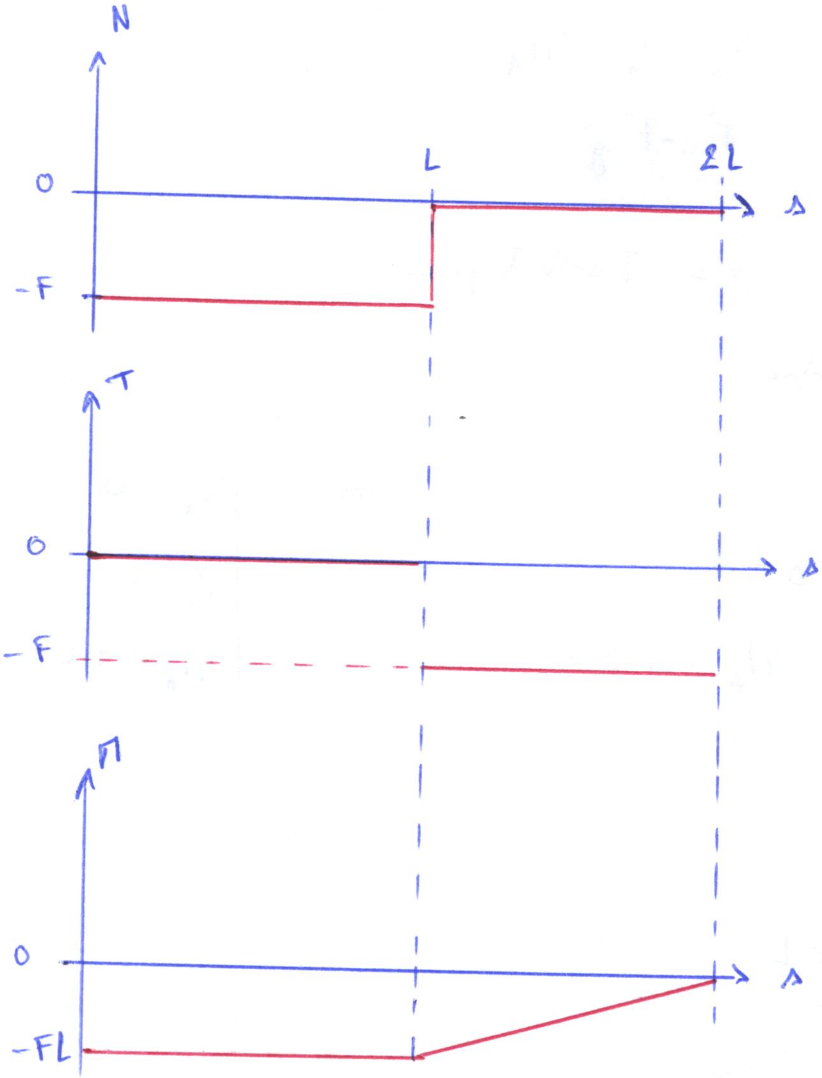
$2^{\text{ème}}$ coupe : $L \leq s \leq 2L$

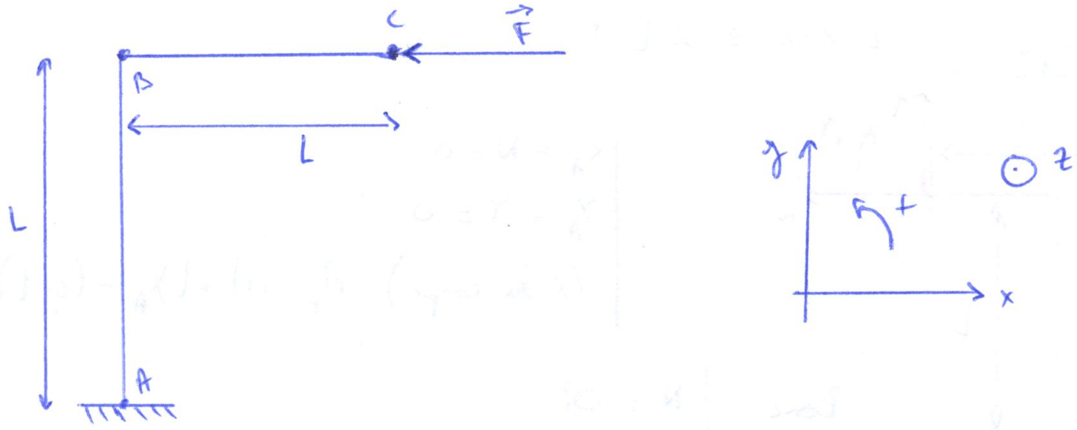


$$\begin{cases} X_A + N = 0 \\ Y_A + T = 0 \\ \text{(à la coupe)} \quad M_A + M + L\,X_A - (s-L)\,Y_A = 0 \end{cases}$$

Donc

$$\begin{cases} N = 0 \\ T = -F \\ M = -FL + (s-L)F = F\,(s-2L) \end{cases}$$





⑥ Bilan : → en A : X_A , Y_A , M_A

→ en C : $\vec{F} = -F\,\vec{x}$

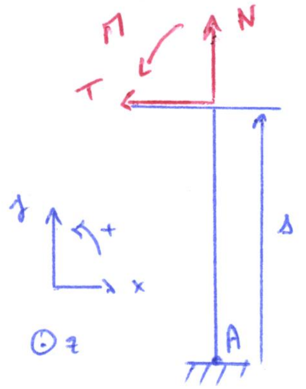
⑦ $h = 3 - 3 \times 1 = 0$ ⟹ Isostatique

⑧ PFS :

$$\begin{cases} X_A - F = 0 \\ Y_A = 0 \\ (\text{en } A) : M_A + FL = 0 \end{cases} \quad \text{Donc} \quad \begin{cases} X_A = F \\ Y_A = 0 \\ M_A = -FL \end{cases}$$

⑨ 2 coupes

⑩ 1ère coupe : $0 \leq s \leq L$

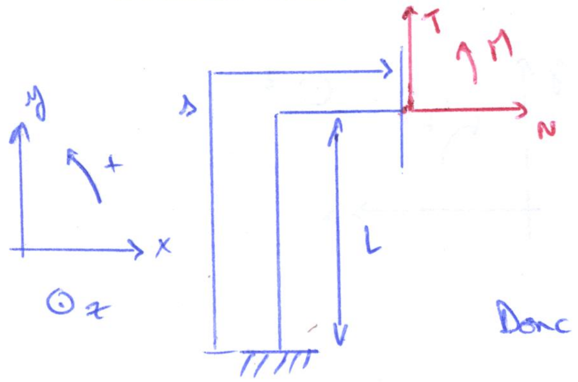


$$\begin{cases} X_A - T = 0 \\ Y_A + N = 0 \\ (\text{à la coupe}) : M_A + M + X_A \cdot s = 0 \end{cases}$$

Donc

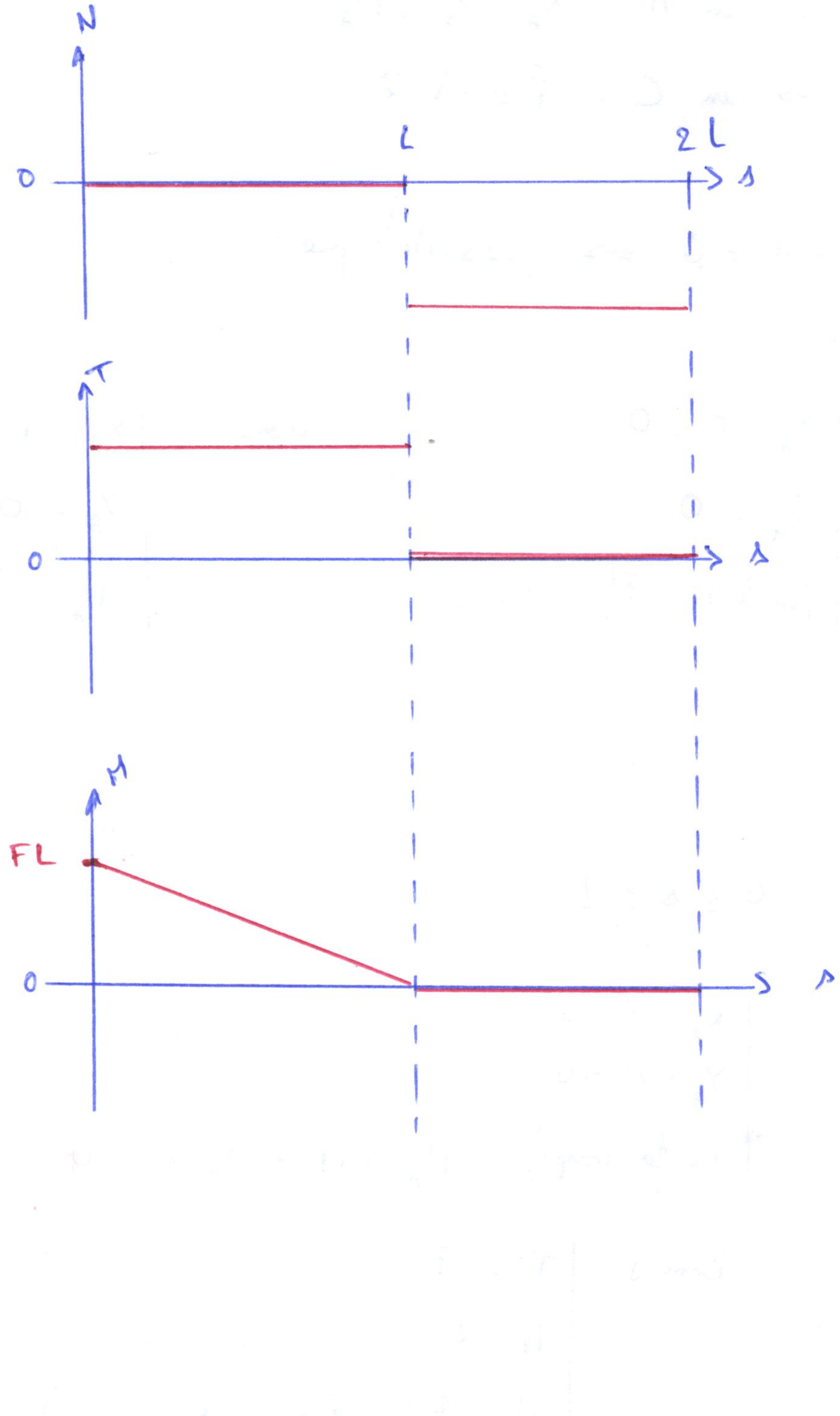
$$\begin{cases} T = F \\ N = 0 \\ M = FL - Fs = F(L-s) \end{cases}$$

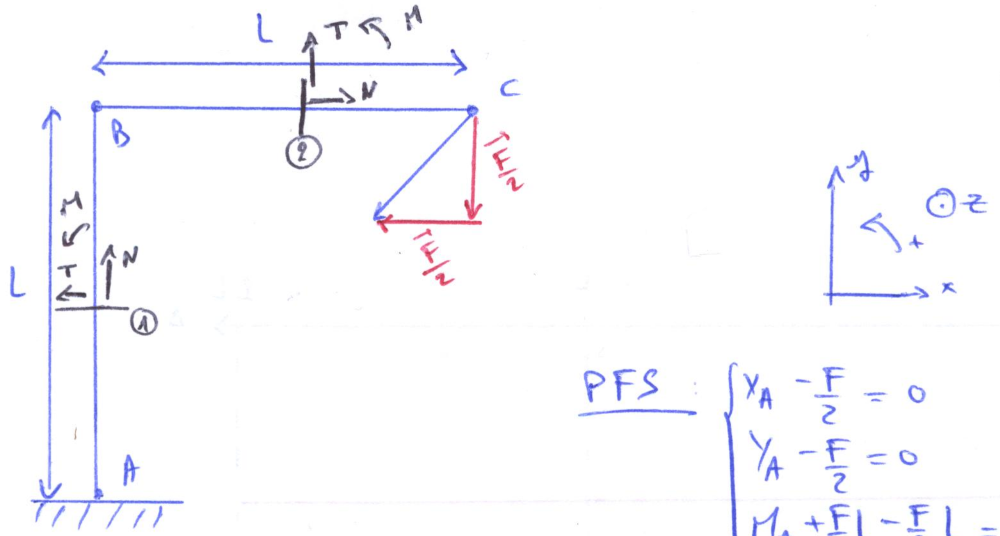
2^{eme} coupe : $L \leq s \leq 2L$



$$\begin{cases} X_A + N = 0 \\ Y_A + T = 0 \\ (\text{à la coupe})\ M_A + M + L X_A - (s-L) Y_A = 0 \end{cases}$$

Donc
$$\begin{cases} N = -F \\ T = 0 \\ M = 0 \end{cases}$$





$$\text{PFS} : \begin{cases} X_A - \frac{F}{2} = 0 \\ Y_A - \frac{F}{2} = 0 \\ M_A + \frac{F}{2}L - \frac{F}{2}L = 0 \end{cases} \iff \begin{cases} X_A = \frac{F}{2} \\ Y_A = \frac{F}{2} \\ M_A = 0 \end{cases}$$

(11) Il suffit d'utiliser le principe de superposition.

(12) 1ère coupe : $0 \leq s \leq L$

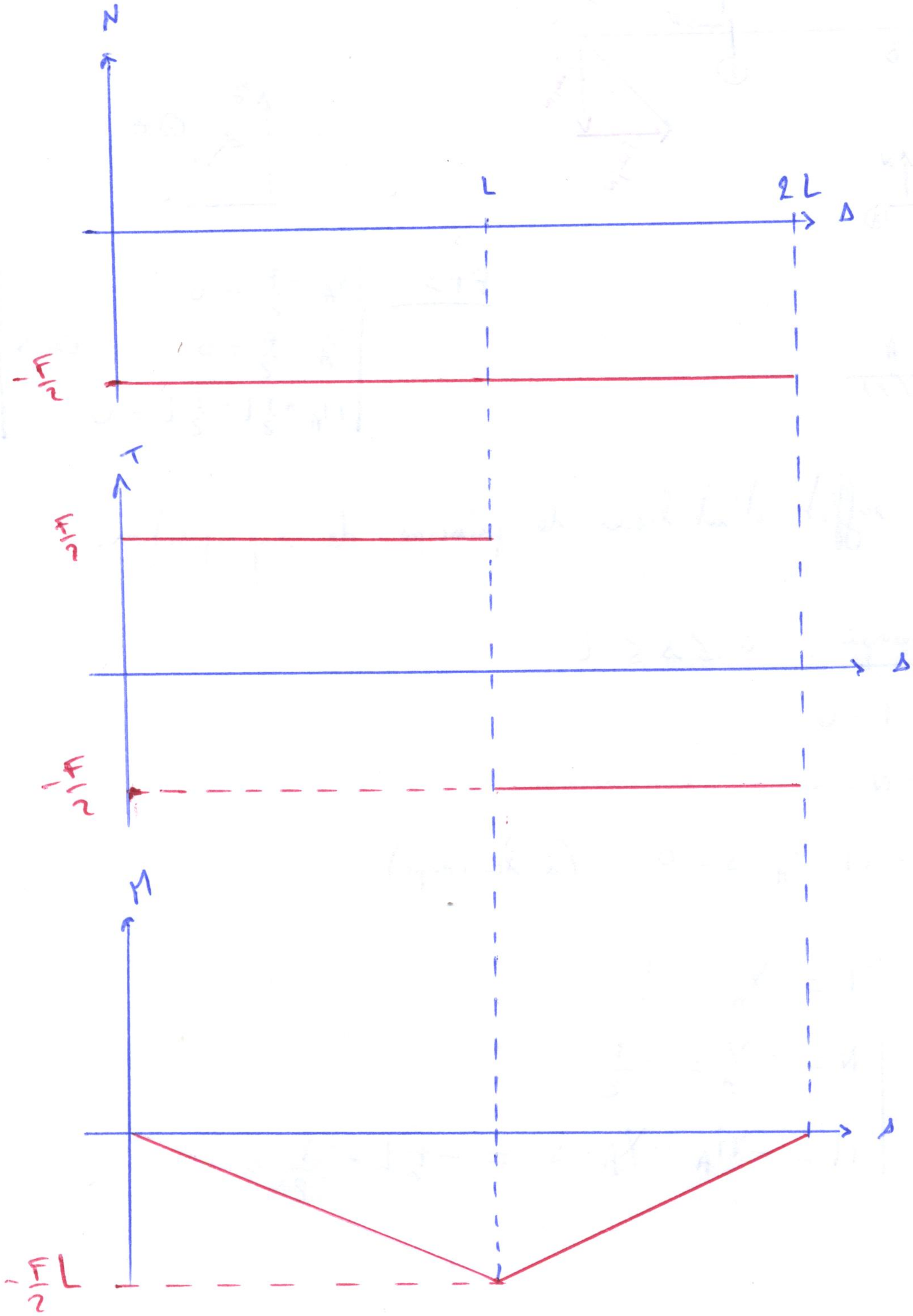
$$\begin{cases} X_A - T = 0 \\ Y_A + N = 0 \\ M_A + M + X_A \cdot s = 0 \quad \text{(à la coupe)} \end{cases}$$

Donc $\begin{cases} T = X_A = \frac{F}{2} \\ N = -Y_A = -\frac{F}{2} \\ M = -M_A - X_A \cdot s = -\frac{F}{2} s \end{cases}$

2ème coupe : $L \leq s \leq 2L$

$$\begin{cases} X_A + N = 0 \\ Y_A + T = 0 \\ \text{(à la coupe)} : M_A + M + L X_A - (s-L) Y_A = 0 \end{cases}$$

Donc $\begin{cases} N = -X_A = -\frac{F}{2} \\ T = -Y_A = -\frac{F}{2} \\ M = -M_A - L X_A + (s-L) Y_A = s\frac{F}{2} - LF = \frac{F}{2}(s-2L) \end{cases}$



N
L
2L
s
$-\frac{F}{2}$
T
$\frac{F}{2}$
s
$-\frac{F}{2}$
M
s
$-\frac{F}{2}L$