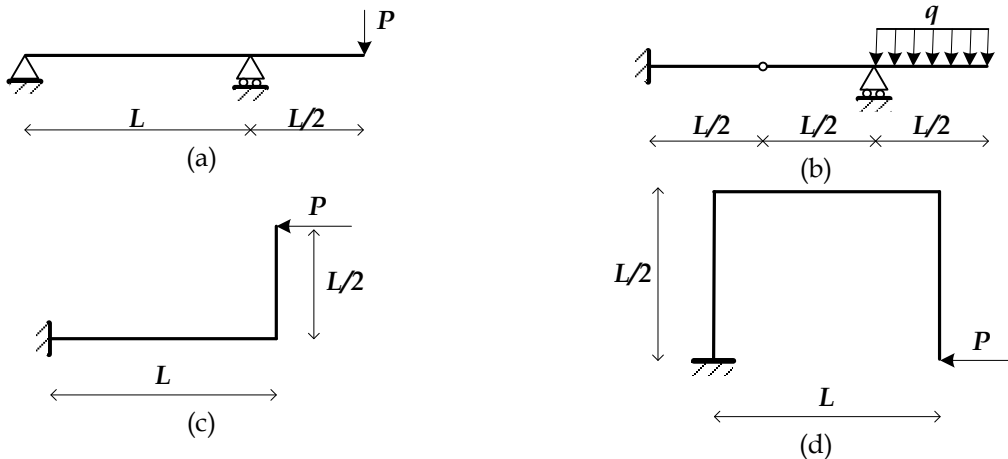


**Devoir de Contrôle**

Durée : 1h30 – Les documents de cours ne sont pas autorisés

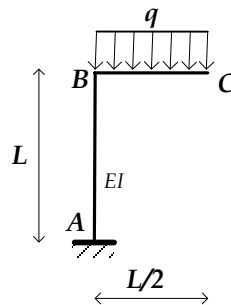
**EXERCICE 1 : (8 POINTS)**

Tracer le diagramme du moment de flexion pour chacune des structures de la figure suivante.



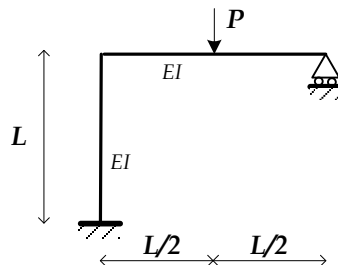
**EXERCICE 2 : (4 POINTS)**

Déterminer la rotation de la section libre (au nœud C) de la structure de la figure ci-dessous.



**EXERCICE 3 : (8 POINTS)**

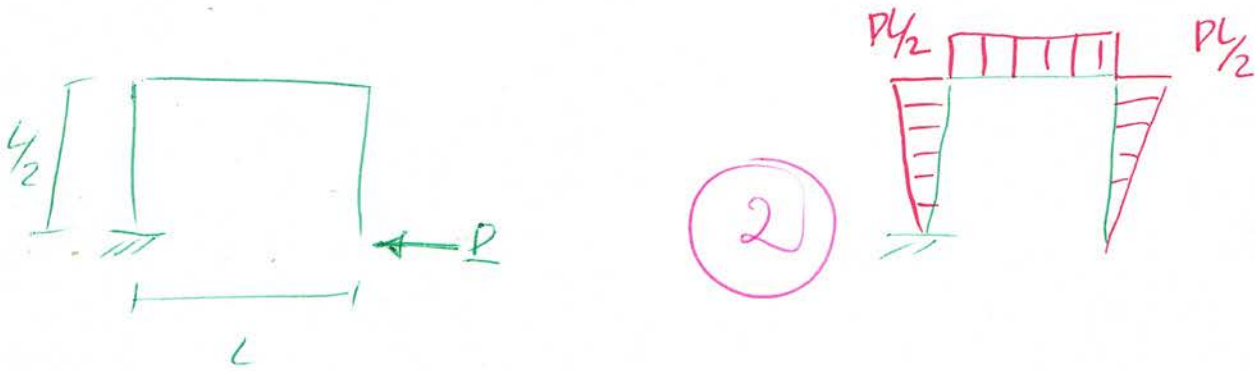
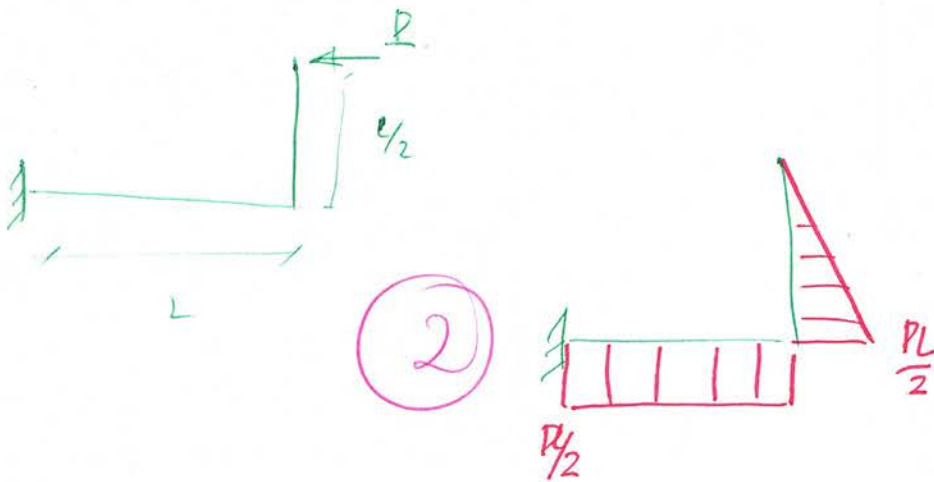
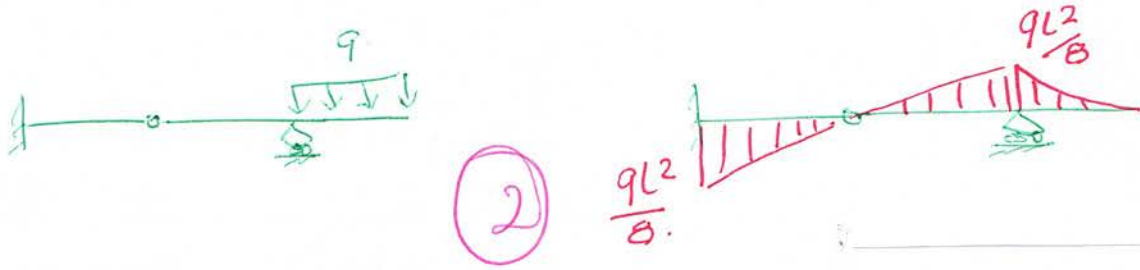
On considère la structure de la figure ci-dessous.



Utiliser la méthode des forces pour tracer les diagrammes du moment de flexion et de l'effort tranchant dans cette structure (On négligera les déformations dues aux efforts normaux et aux efforts tranchants).

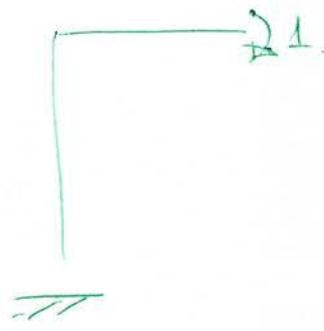
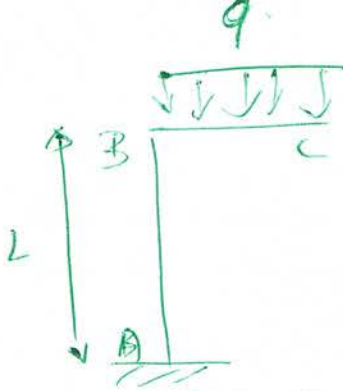
*Bon Courage*

Ex 1:

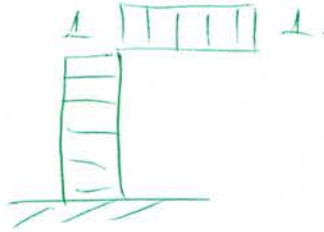
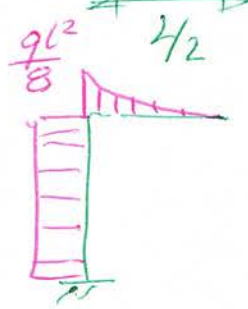


Ex2:

(2)



(2)



Cinématique  
réelle

Statique  
virtuelle

Tableau:

$$\theta = \frac{1}{2EI} \left[ \frac{1}{12} \cdot 4 \cdot \frac{qL^2}{8} \right] + \frac{L}{EI} \cdot \frac{qL^2}{8} \cdot 1$$

$$\theta = \frac{L}{2EI} \cdot \frac{qL^2}{24} + \frac{L}{EI} \cdot \frac{qL^2}{8}$$

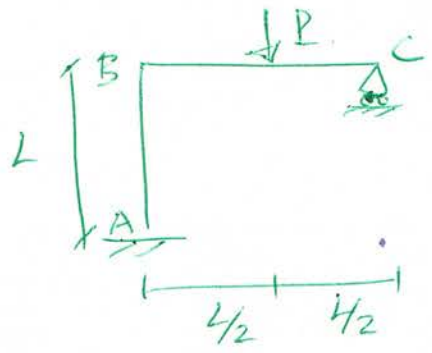
$$\theta = \frac{qL^3}{48EI} + \frac{6 \cdot qL^3}{48EI}$$

(2)

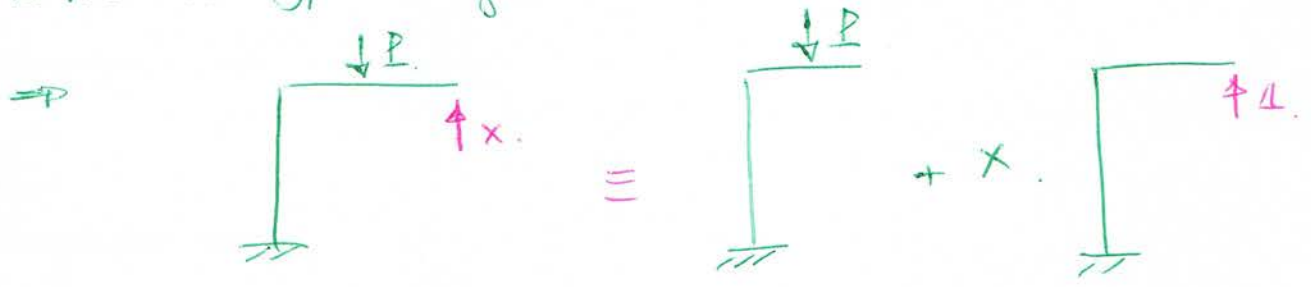
$$\theta = \frac{7qL^3}{48EI}$$

Ex 3 :

(3)



Structure hyp. de degré 1.

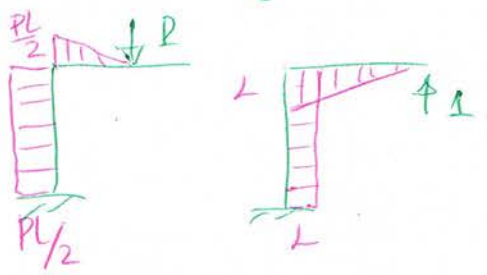


Condition de compatibilité cinématique  
 dép. vertical en C = 0.

(2)

Cause =		
Effet	$a_{10}$	$a_{11}$
Déplacement selon x	$a_{10} =$	$a_{11} =$

\* Calcul de  $a_{10}$  :



$$= \frac{L}{EI} \left( -\frac{29}{48} \cdot PL^2 \right)$$

$$= -\frac{29}{48} \frac{PL^3}{EI}$$

(2)

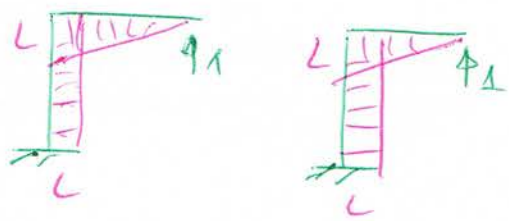
$$a_{10} = \frac{L}{EI} \cdot \left( -\frac{1/2(3-1/2)}{6} \right) \cdot \frac{PL}{2} \cdot L - \frac{L}{EI} \cdot L \cdot \frac{PL}{2}$$

$$= \frac{L}{EI} \left[ -\frac{5}{24} \cdot \frac{PL}{2} \cdot L - \frac{PL^2}{2} \right] = \frac{L}{EI} \left[ -\frac{5}{48} \cdot PL^2 - \frac{24PL^2}{48} \right]$$

\* Calcul de  $a_{11}$  :

(4)

(2)



$$a_{11} = \frac{1}{EI} \cdot \left[ \frac{1}{3} \cdot L \cdot L \right] + \frac{1}{EI} \cdot L \cdot L = \frac{L^3}{3EI} + \frac{L^3}{EI} = \frac{4L^3}{3EI}$$

$$a_{11} = \frac{4L^3}{3EI}$$

(2)

La condition de compatibilité cinématique s'écrit :

$$a_{10} + X \cdot a_{11} = 0$$

$$\Rightarrow -\frac{29}{48} \cdot \frac{PL^3}{EI} + X \cdot \frac{4L^3}{3EI} = 0$$

$$\Rightarrow \frac{4}{3} \cdot X = \frac{29}{48} \cdot P$$

$$\Rightarrow X = \frac{3}{4} \cdot \frac{29}{48} \cdot P$$

$$X = \frac{29}{64} P$$

Diagrammes :

