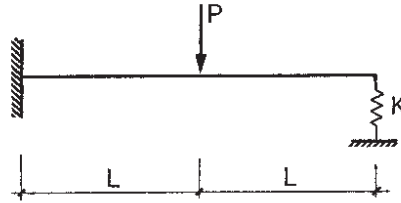
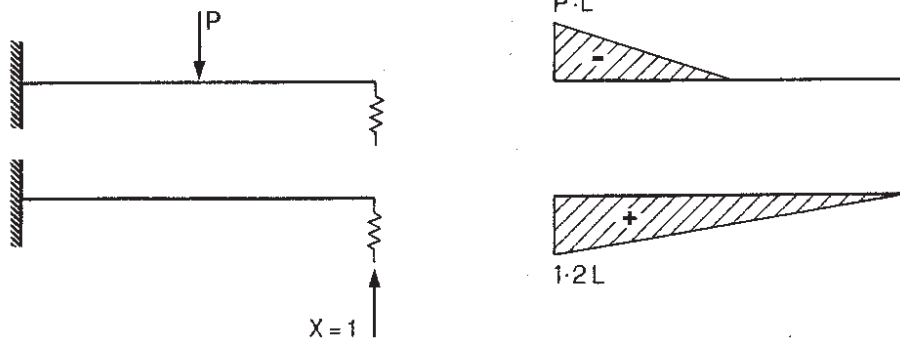


1.



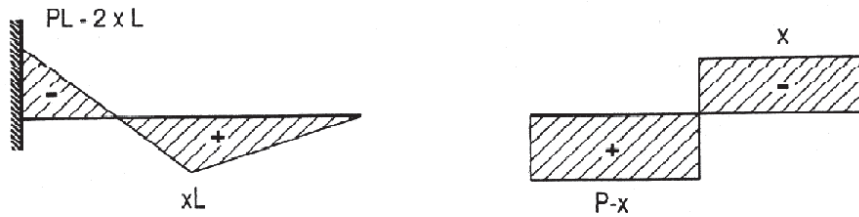
Système fondamental :



causes		
effets		
déplacements selon X	$a_0 = -\frac{5PL^3}{6EI}$	$a_1 = \frac{8L^3}{3EI} + \frac{1}{K}$

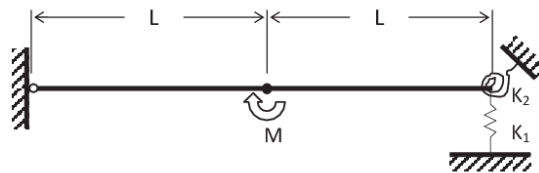
Condition de compatibilité cinématique :

$$a_0 + a_1 X = 0 \quad \rightarrow \quad X = -\frac{a_0}{a_1} = \frac{5 PL^3}{16L^3 + \frac{6EI}{K}}$$

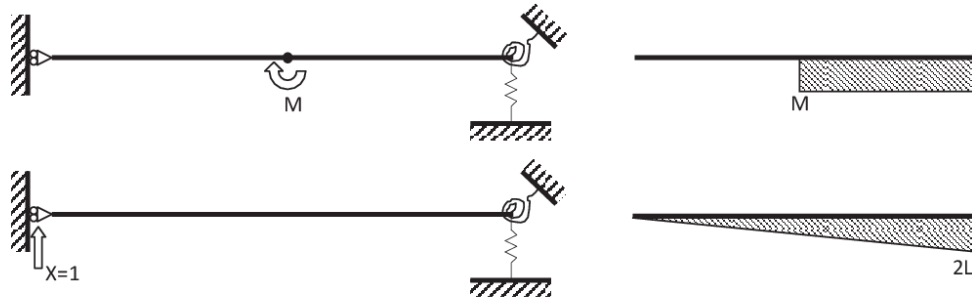


**M :**

**V :**

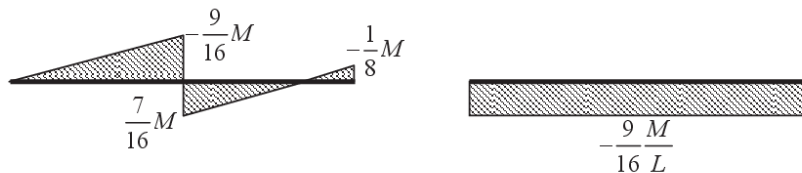


Système fondamental :

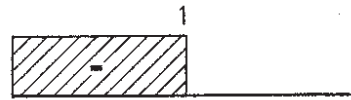
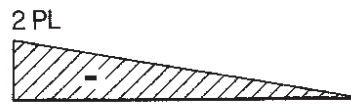
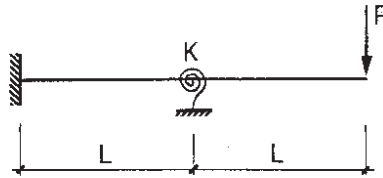


Causes		
Effets		
Déplacements selon X	$a_0 = \frac{3ML^2}{2EI} + \frac{M \cdot 2L}{K_2}$	$a_1 = \frac{8L^3}{3EI} + \frac{4L^2}{K_2} + \frac{1}{K_1}$

$$a_0 + a_1 X = 0 \rightarrow X = \frac{a_0}{a_1} = \frac{\frac{3ML^2}{2EI} + \frac{M \cdot 2L}{K_2}}{\frac{8L^3}{3EI} + \frac{4L^2}{K_2} + \frac{1}{K_1}} \left\{ \begin{array}{l} \text{si } K_1 = K_2 = \infty \\ X = -\frac{9M}{16L} \end{array} \right.$$



2.

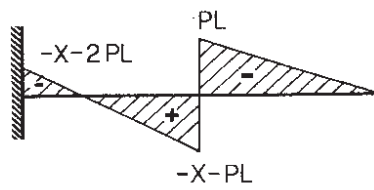


causes		
effets		
déplacements selon X	$a_0 = \frac{3PL^2}{2EI}$	$a_1 = \frac{L}{EI} + \frac{1}{K}$

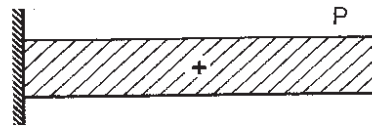
Condition de compatibilité cinématique :

$$a_1 X + a_0 = 0 \quad \rightarrow \quad X = -\frac{a_0}{a_1} = -\frac{3PL^2}{2(L + \frac{EI}{K})}$$

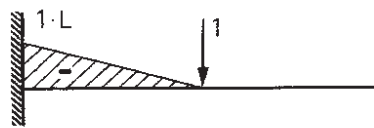
**M:**



**V:**



Flèche au milieu :  $f = f_0 + f_1 \cdot x_1$



$$f_0 = \frac{5PL^3}{6EI}$$

$$f_1 = \frac{L^2}{2EI}$$

$$\longrightarrow f = \frac{1}{6EI} \left( 5PL^3 - \frac{9PL^4}{2(L + \frac{EI}{K})} \right)$$

Effet de  $\Delta T$



$$d\phi = -\frac{\alpha \Delta T}{h} dx$$

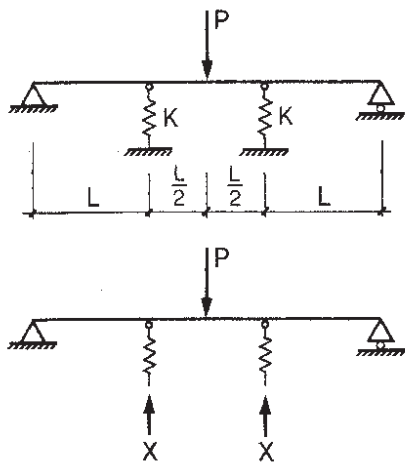
$$a_0 = \alpha \frac{\Delta T}{h} L \longrightarrow X = -\frac{a_0}{a_1} = -\frac{\alpha \Delta T L}{\left(\frac{L}{EI} + \frac{1}{K}\right)}$$

Flèche au milieu :

$$f_0 = \frac{1}{2} \frac{\alpha \Delta T}{h} L^2$$

$$\longrightarrow f = f_0 + f_1 x_1 = \frac{1}{2} \frac{\alpha \Delta T}{h} L^2 - \frac{\alpha \Delta T L^3}{2h \left(L + \frac{EI}{K}\right)}$$

3.

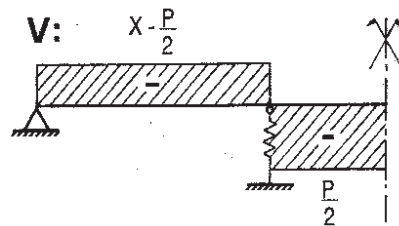
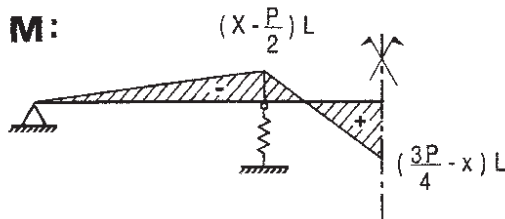


voir 5) exercice n°3

$$a_0 = -\frac{23 PL^3}{24 EI}$$

$$a_1 = \frac{5 L^3}{3 EI} + \frac{2}{K}$$

$$\rightarrow X = -\frac{a_0}{a_1} = \frac{23 PL^3}{40 L^3 + \frac{48 EI}{K}}$$



Tassement d'appui :

$$\frac{a_1}{2} x = -\Delta \rightarrow X = -\frac{2 \Delta}{\left(\frac{5 L^3}{3 EI} + \frac{2}{K}\right)}$$

