⇒ Flèche :

• Sur $\frac{L}{2} < x < L$: $EI\,y'' = -Mf = -\frac{Fx}{2} + \frac{FL}{2}$

$$EI\,y' = -\frac{Fx^2}{4} + \frac{FLx}{2} + C_1$$

$$EI\,y = -\frac{Fx^3}{12} + \frac{FLx^2}{4} + C_1 x + C_2$$

• Limites : en $x = \frac{L}{2} \Rightarrow y' = 0 \Rightarrow C_1 = -\frac{3FL^2}{16}$

en $x = L \Rightarrow y = 0 \Rightarrow C_2 = \frac{FL^3}{48}$

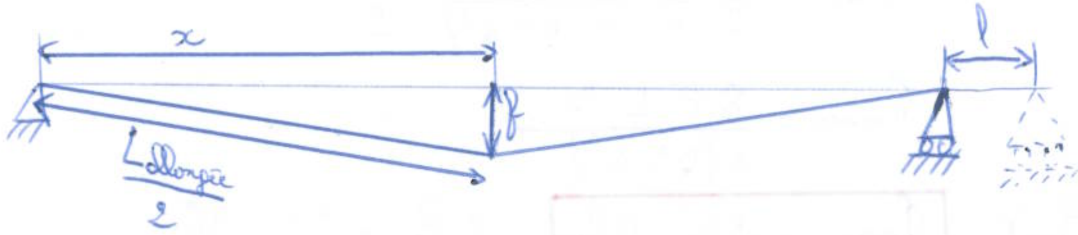
Donc $y = \frac{1}{EI}\left(-\frac{Fx^3}{12} + \frac{FLx^2}{4} - \frac{3FL^2x}{16} + \frac{FL^3}{48}\right)$

En $\frac{L}{2}$: $f = \frac{64\,F}{E \times \pi(D^4 - d^4)}\left(-\frac{(L/2)^3}{12} + \frac{L(L/2)^2}{4} - \frac{3L^2(L/2)}{16} + \frac{L^3}{48}\right)$

$f = -0{,}097\,m = \boxed{97\text{ mm de flèche}}$

Comment déterminer l ???

Idée : On approxime le comportement de la barre :



Pythagore : $l = L - 2x$

$$= L - 2\sqrt{\left(\frac{L_{allongée}}{2}\right)^2 - f^2}$$

$l \approx 0$???