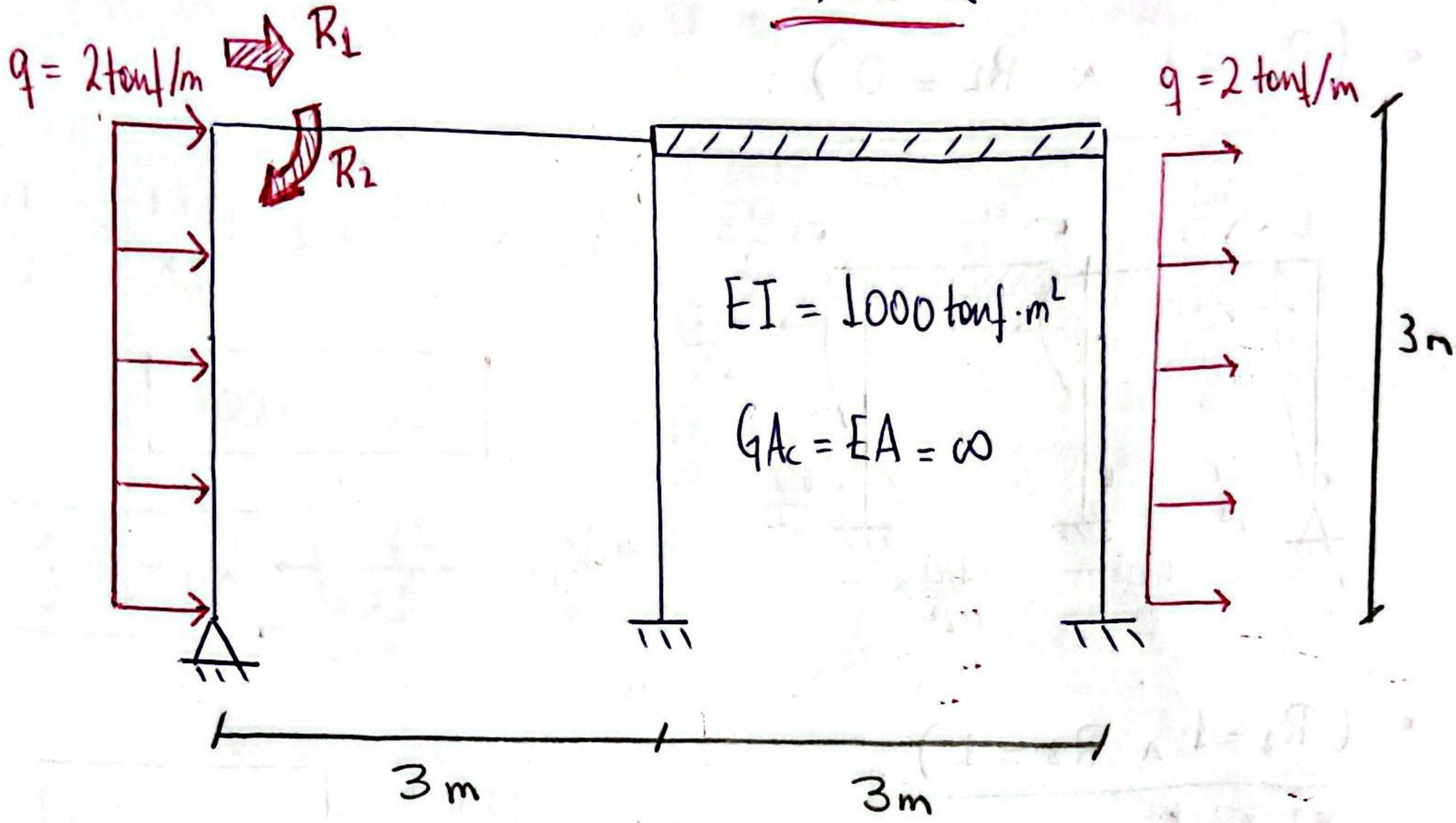
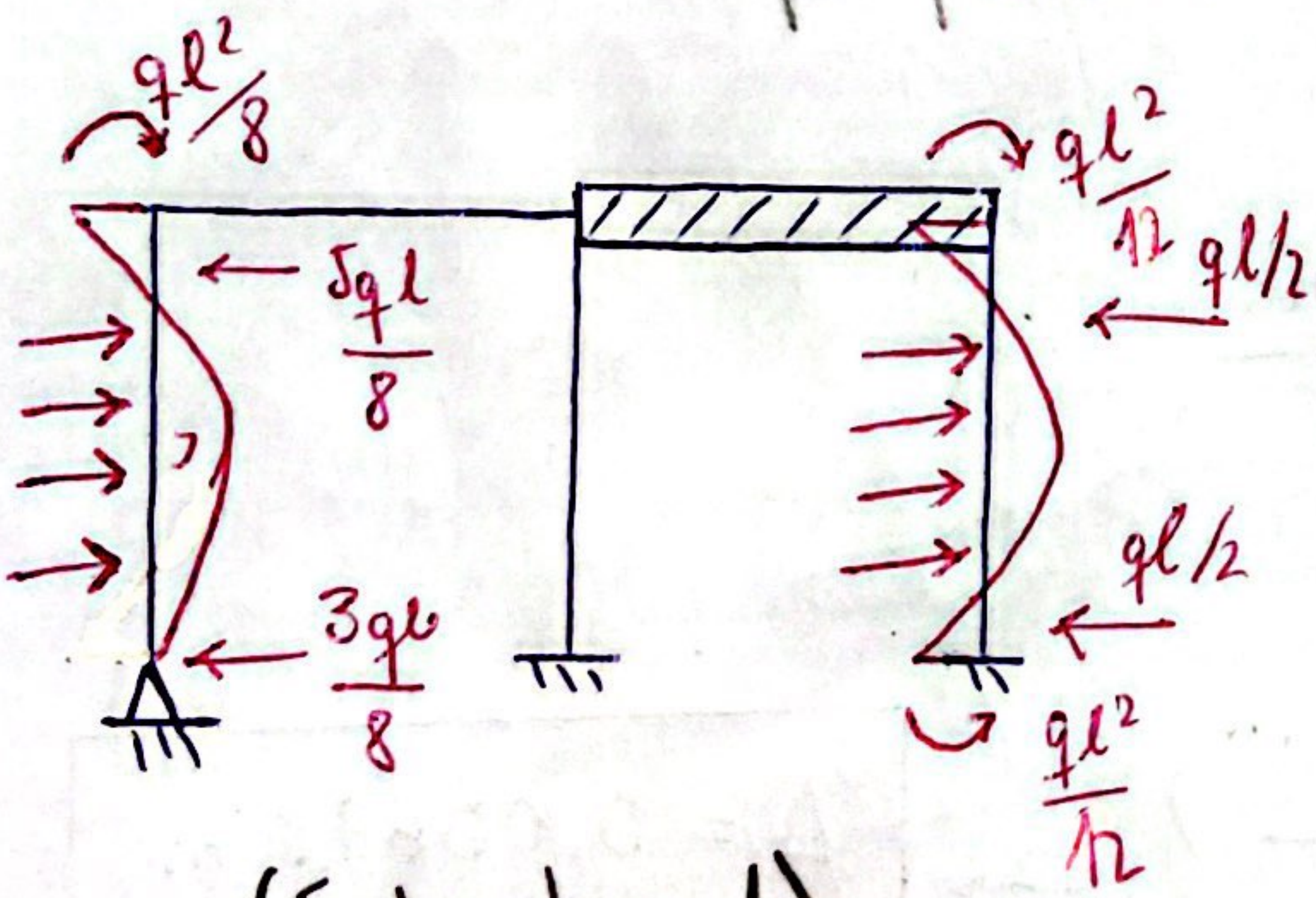
Pauta Auxiliar 3 - P1

Luis Cárcamo Del Río

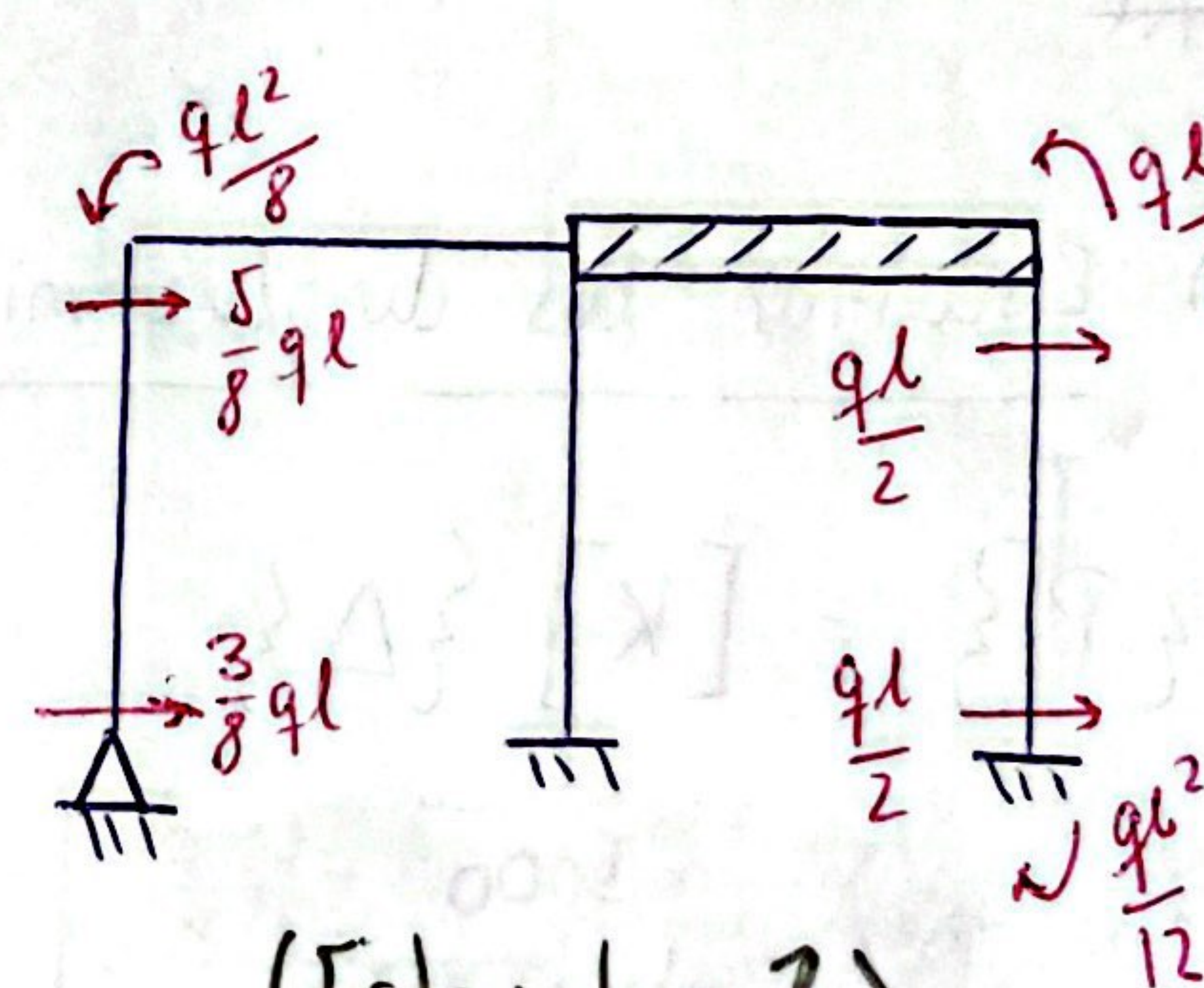
GDL = 2



Para tratar con las cargas distribuidas en el método de rigidez, es necesario entender la estructura original como una superposición de dos estructuras.



(Estructura 1)



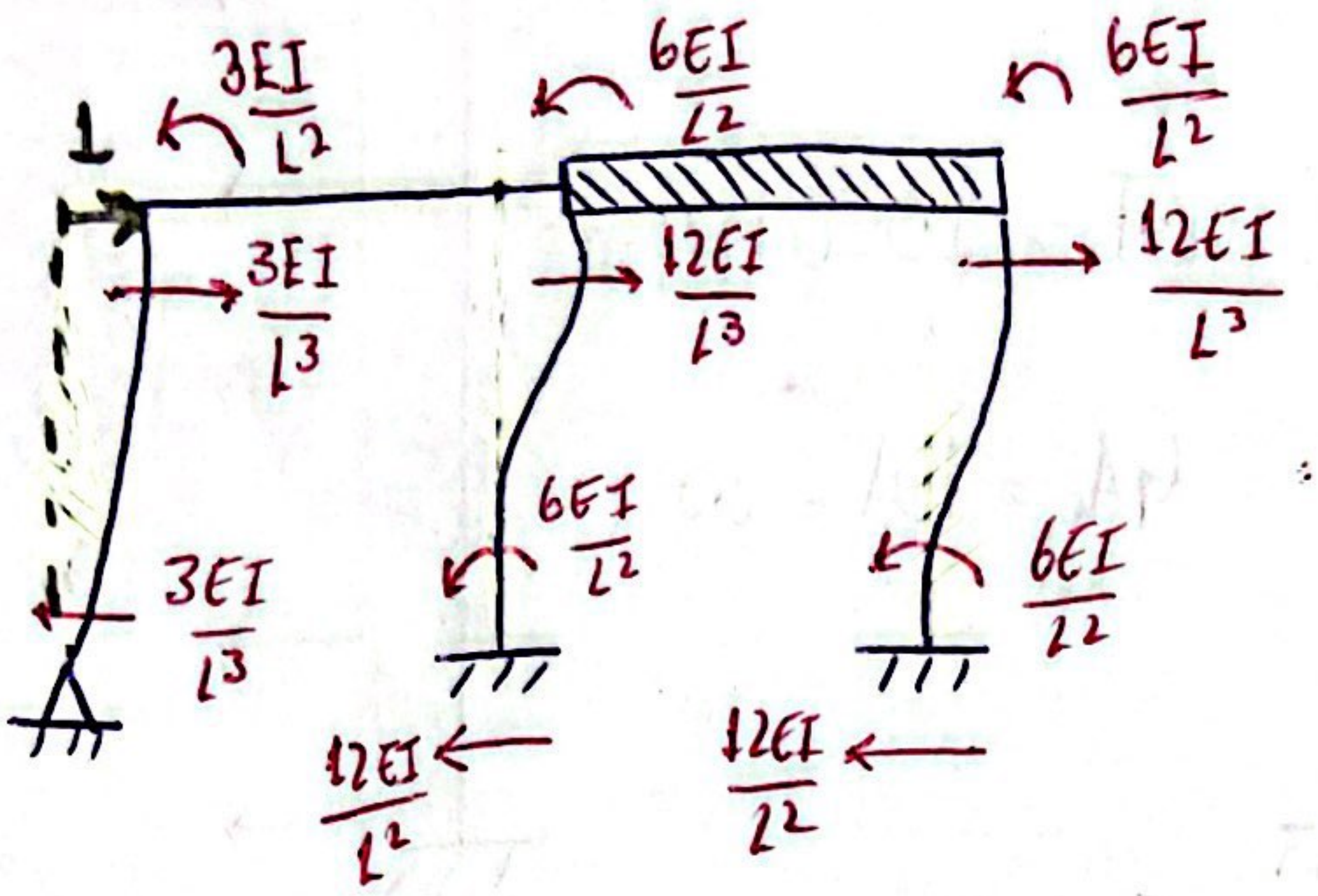
(Estructura 2)

i) Vector de cargas $\{P\}$

$$\{P\} = \begin{Bmatrix} \frac{5}{8}ql + \frac{ql}{2} \\ -\frac{ql^2}{8} \end{Bmatrix} \longrightarrow \boxed{\{P\} = \begin{Bmatrix} 6{,}75 \\ -2{,}25 \end{Bmatrix}}$$

ii) Matriz de rigidez (estructura 2):

• $(R_1 = 1 \wedge R_2 = 0)$:

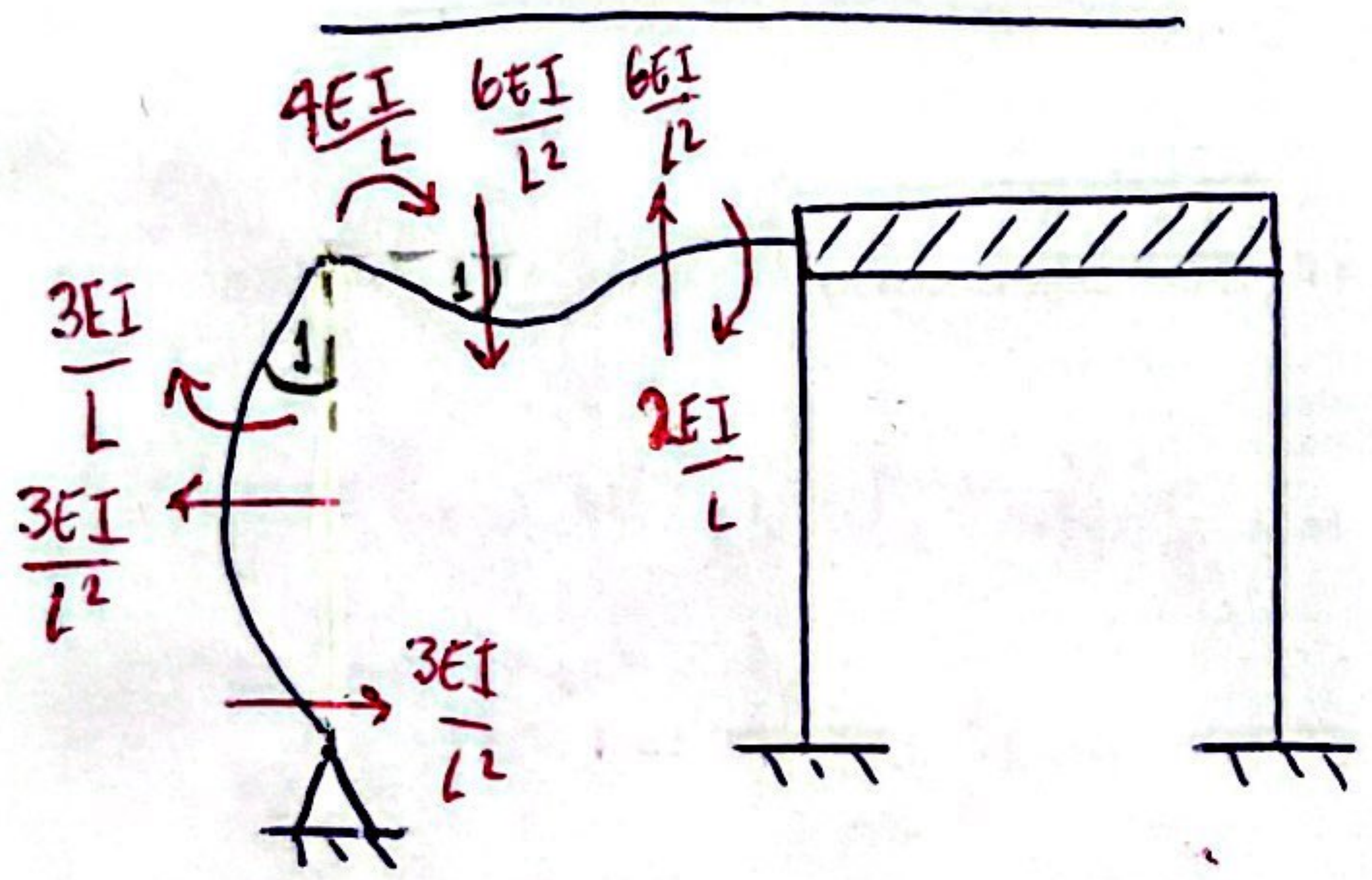


• $k_{11} = \frac{3EI}{L^3} + 2 \cdot \frac{12EI}{L^3} = \frac{27EI}{L^3}$

$\rightarrow \boxed{k_{11} = 1000}$

• $k_{12} = -\frac{3EI}{L^2} \rightarrow \boxed{k_{12} = -\frac{1000}{3}}$

• $(R_1 = \ \wedge R_2 = 1)$:



• $k_{22} = \frac{7EI}{L} \rightarrow \boxed{k_{22} = \frac{7000}{3}}$

• $k_{21} = -\frac{3EI}{L^2} \rightarrow \boxed{k_{21} = -\frac{1000}{3}}$

iii) Encontrar los desplazamientos:

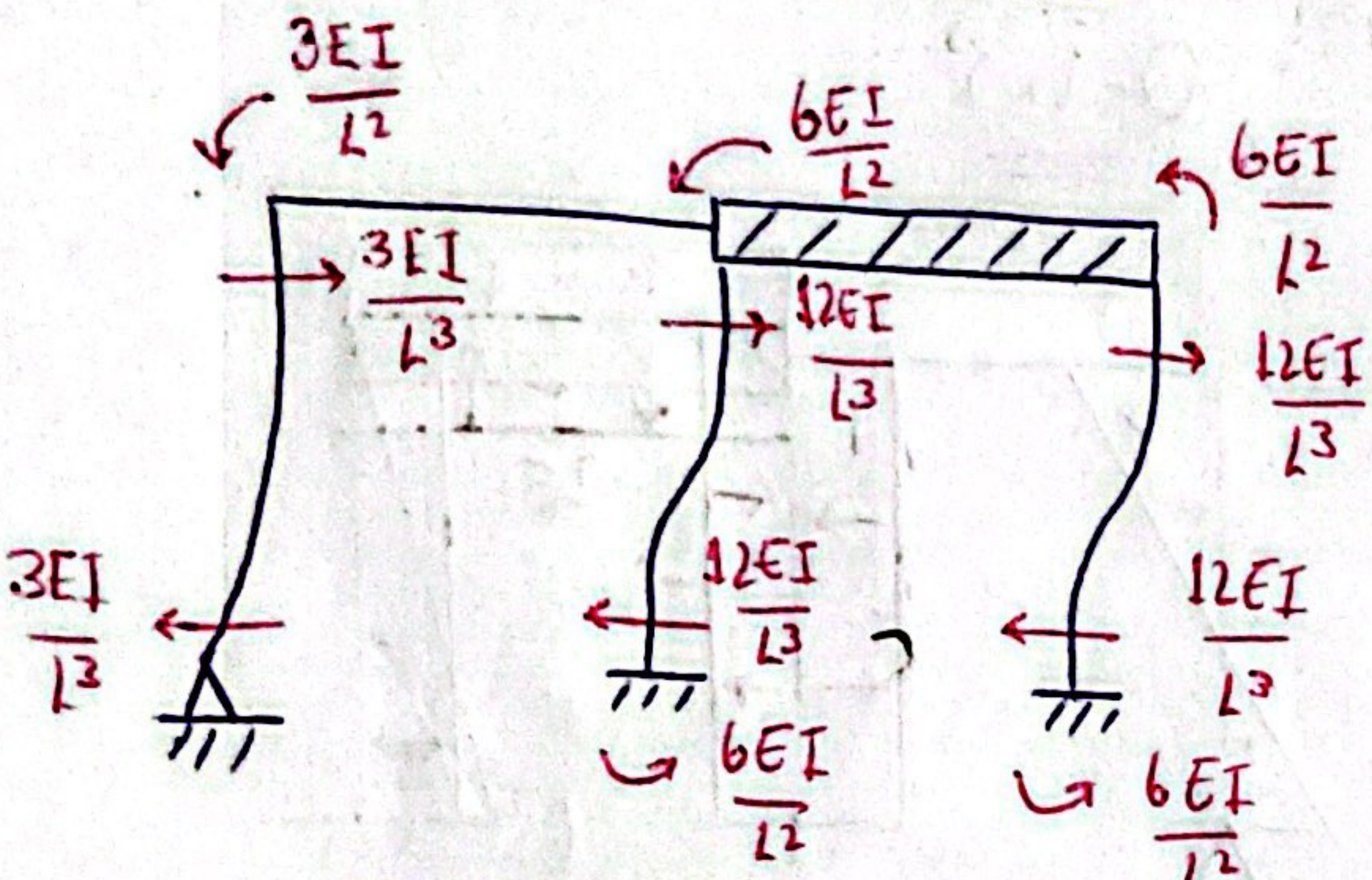
$$\{P\} = [K]\{\Delta\}$$

$$\begin{Bmatrix} 6{,}75 \\ -2{,}25 \end{Bmatrix} = \begin{bmatrix} 1000 & -\frac{1000}{3} \\ -\frac{1000}{3} & \frac{7000}{3} \end{bmatrix} \begin{Bmatrix} \Delta \\ \theta \end{Bmatrix} \rightarrow \boxed{\begin{array}{c} \Delta = 0{,}00675 \text{ m} \\ \hline \theta = 0 \text{ rad} \end{array}}$$

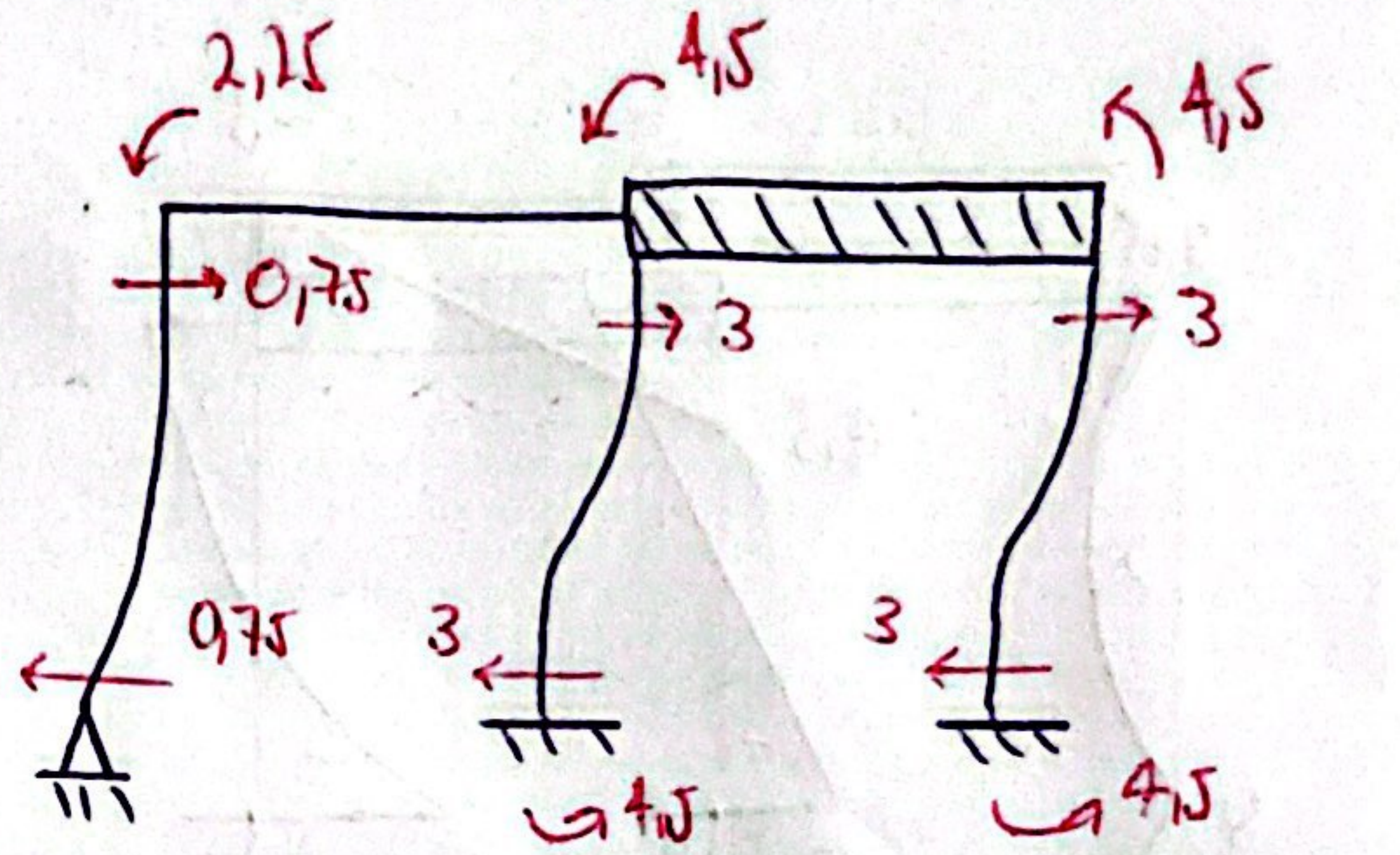
Ahora aplicamos el principio de superposición

considerando $\Delta = 0{,}00675\ m$, $EI = 1000\ tonf\ m^2$ y $L = 3m$.

Diagramas estructura 2: (solo redundante 1)

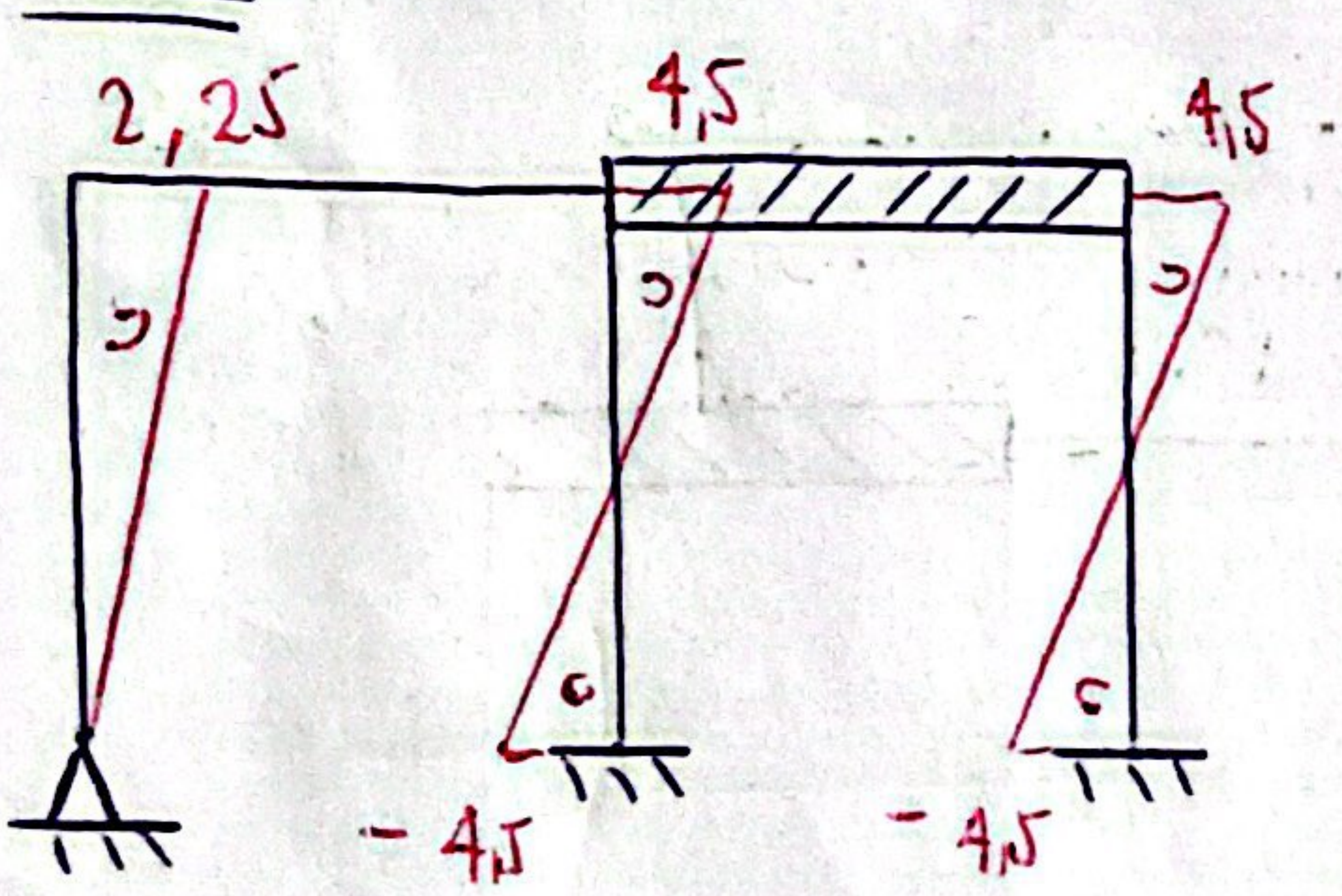


=>

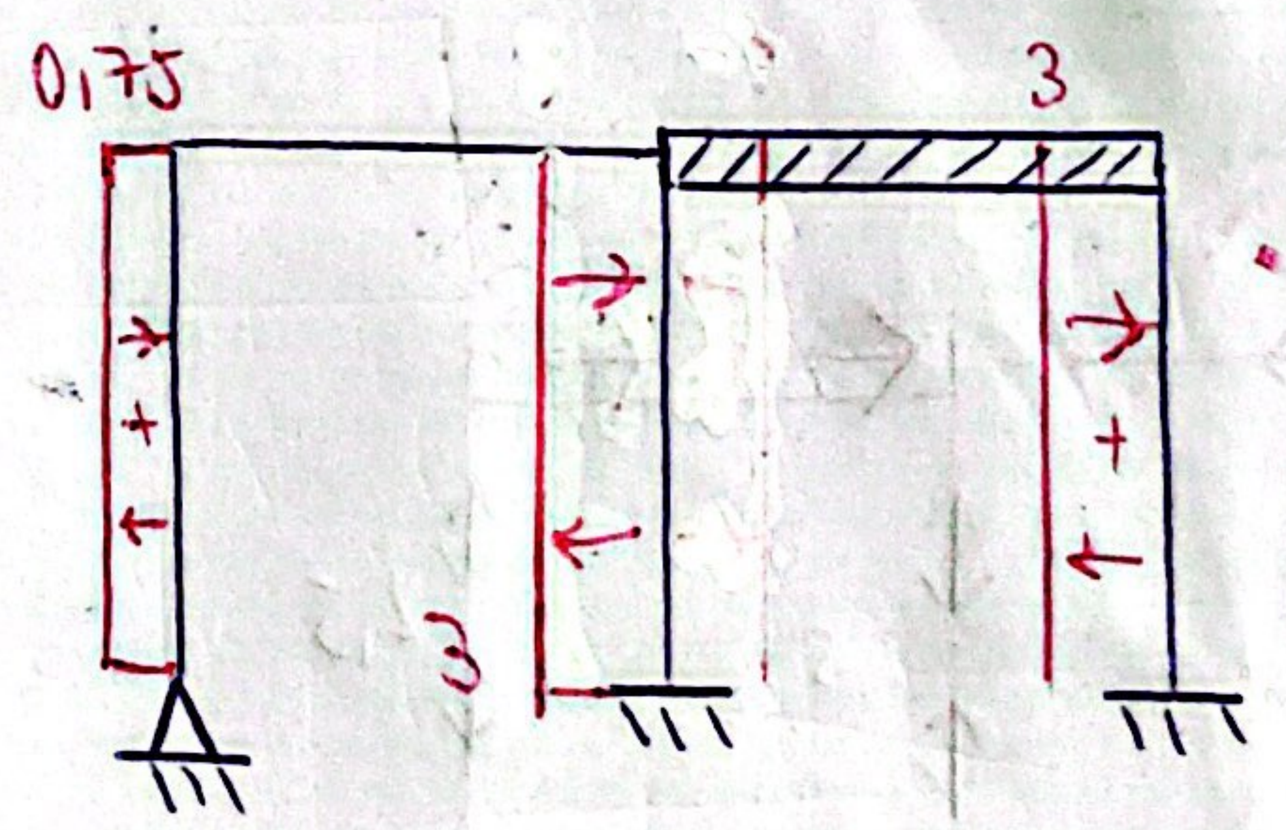


$\times\ \Delta = 0{,}00675$

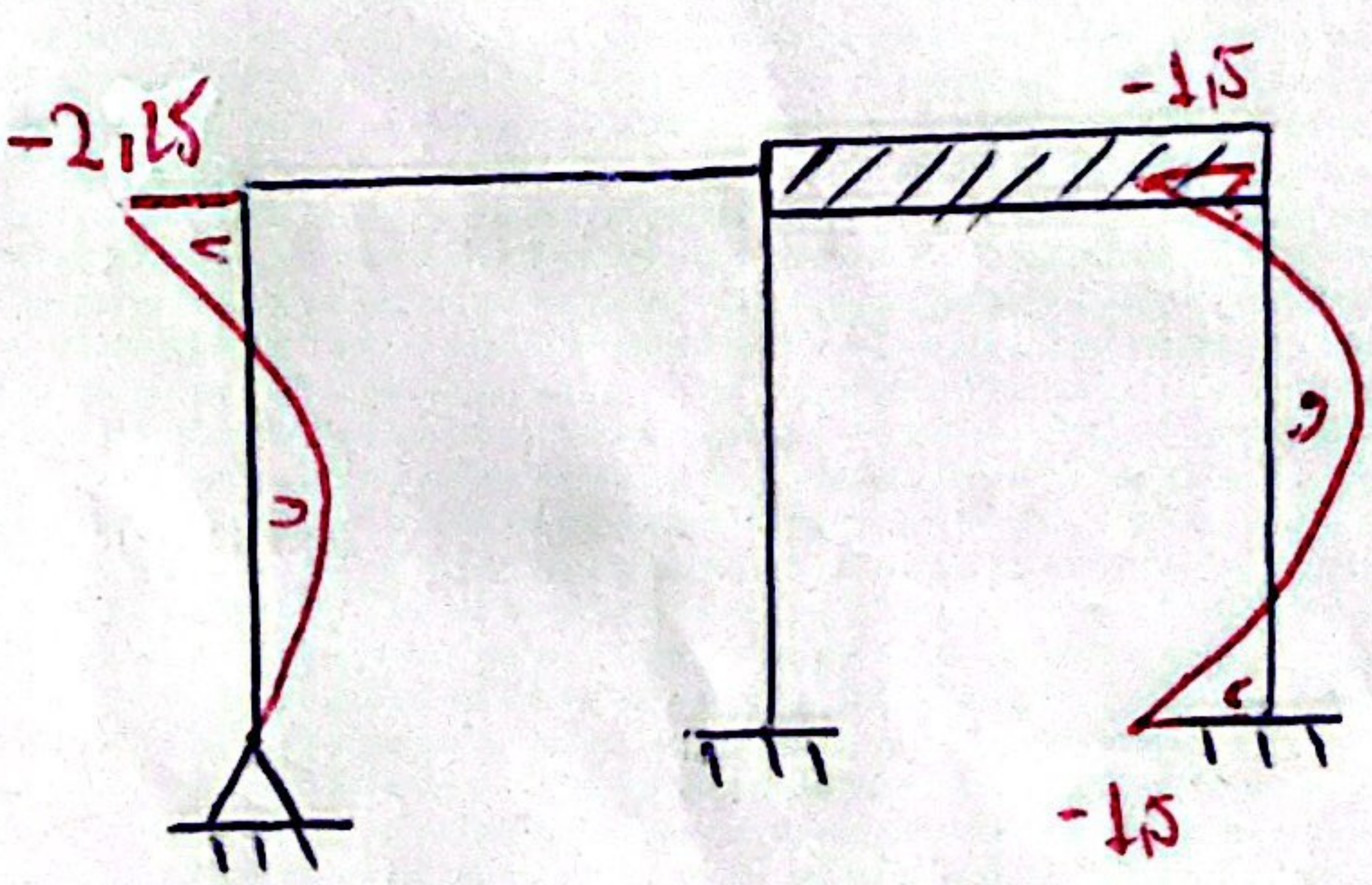
$M_2(x)$: (tonf-m)

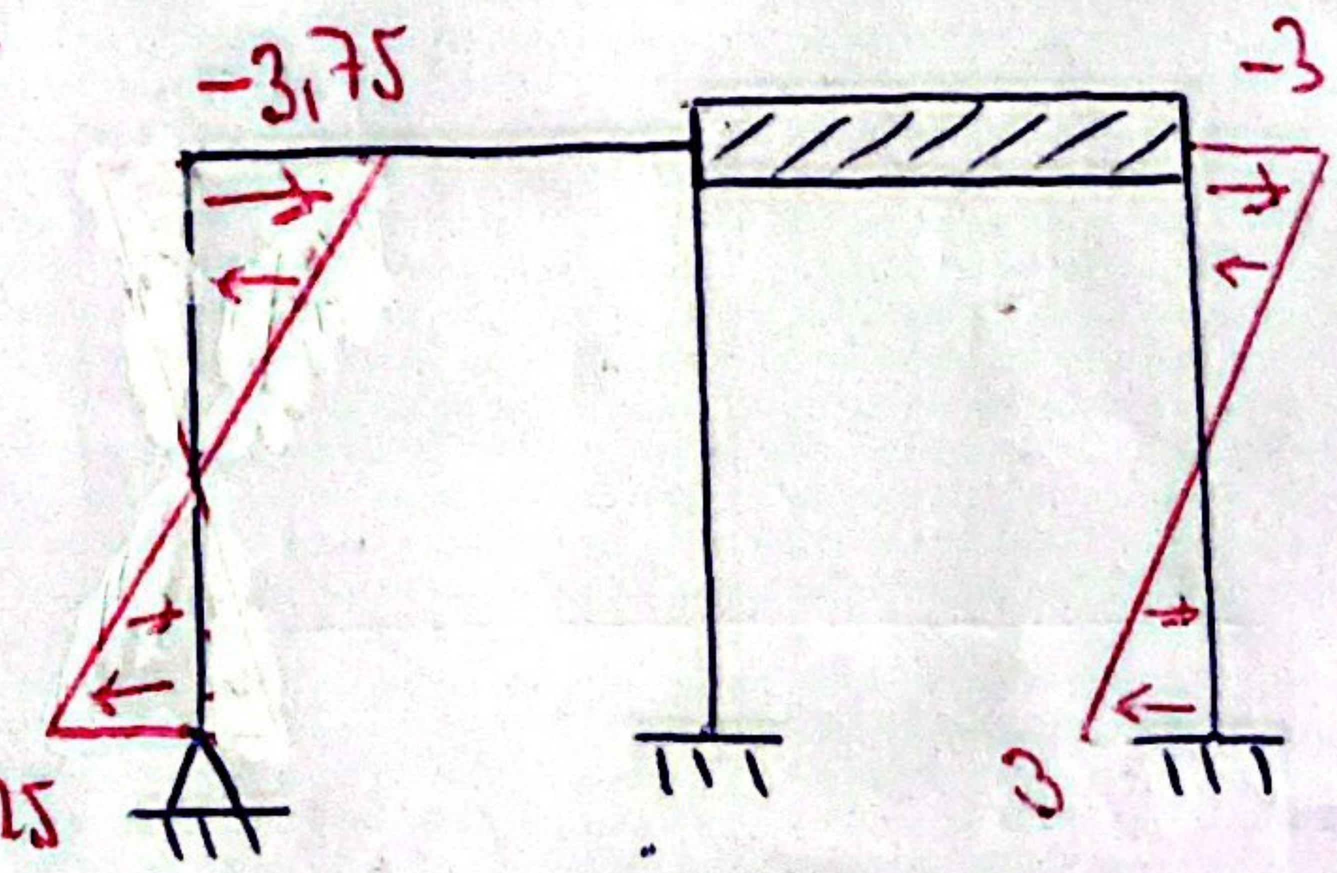


$Q_2(x)$ (tonf)



Diagramas estructura 1:



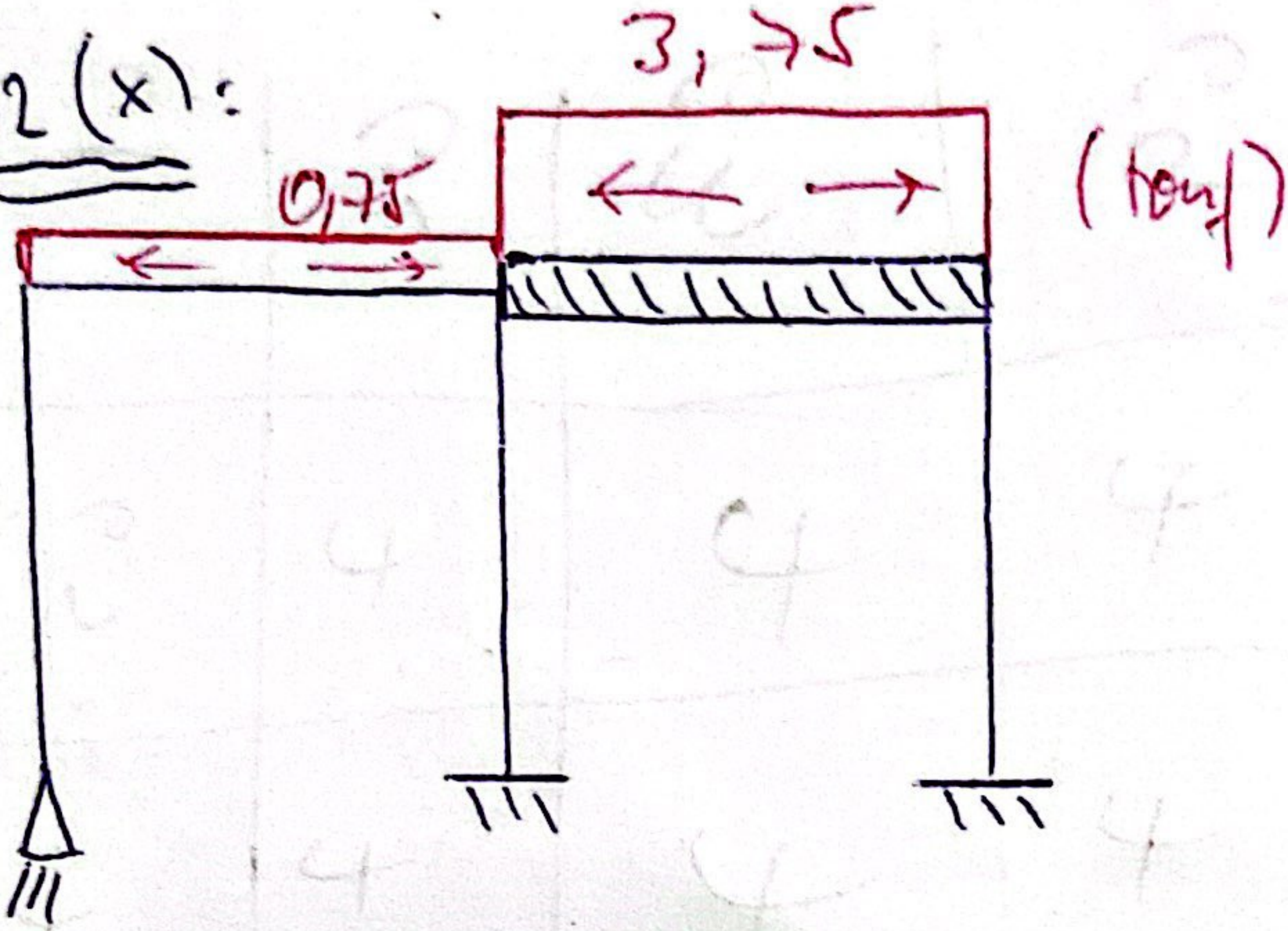


$M_a(x)$:

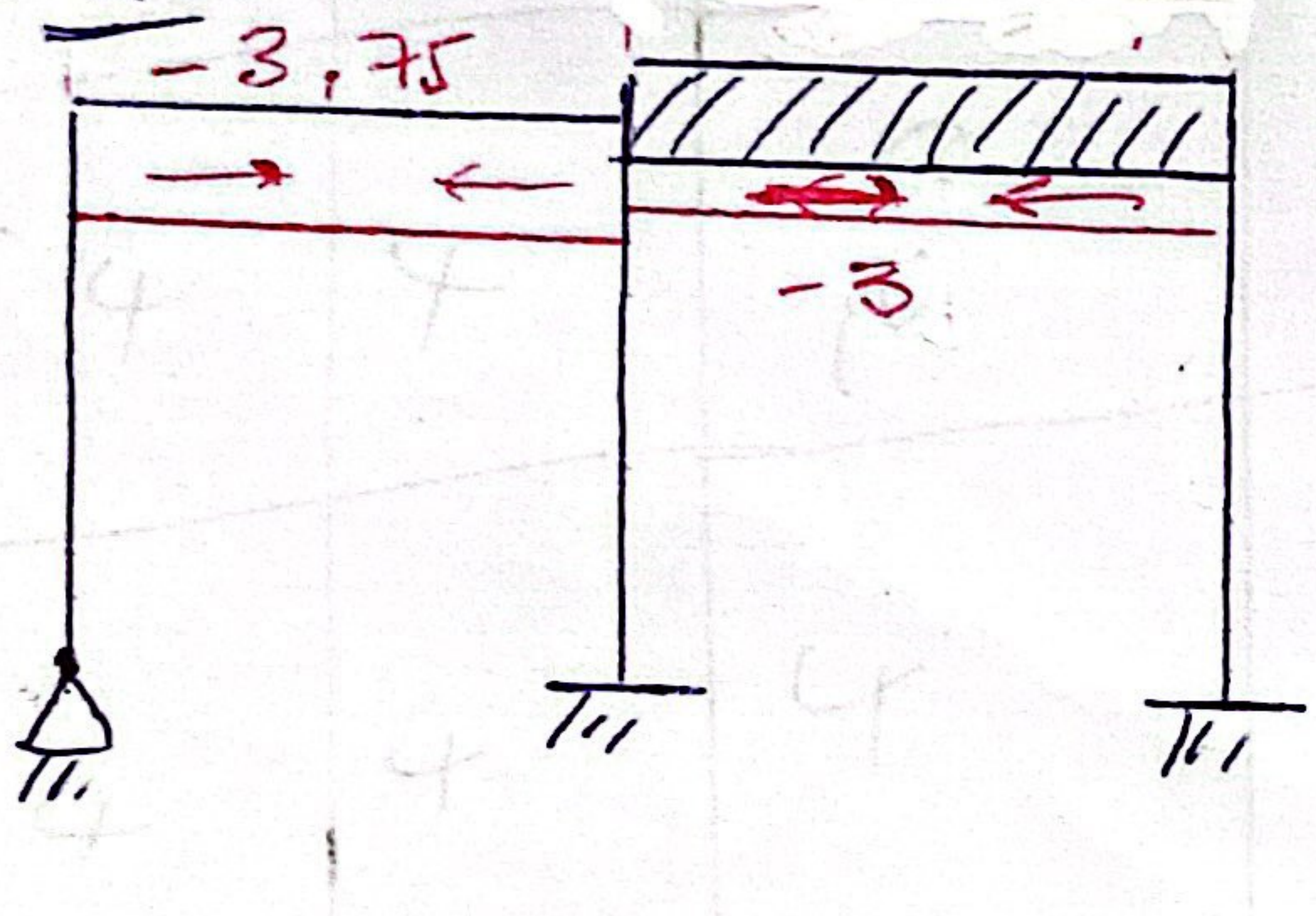
$Q_a(x)$:

Scanned with CamScanner

$N_2(x)$:

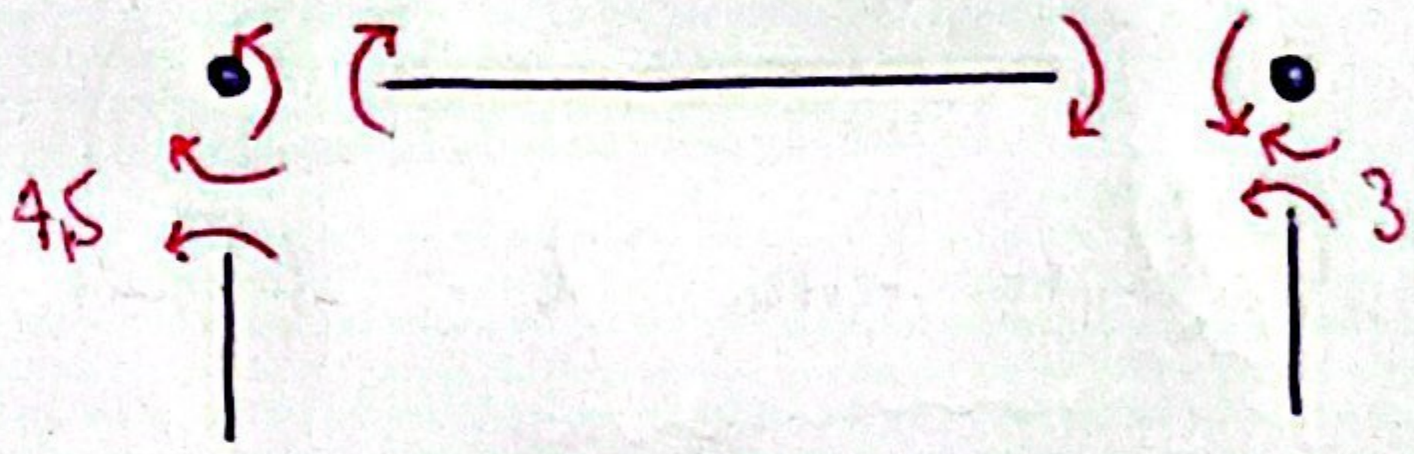


$N_Q(x)$

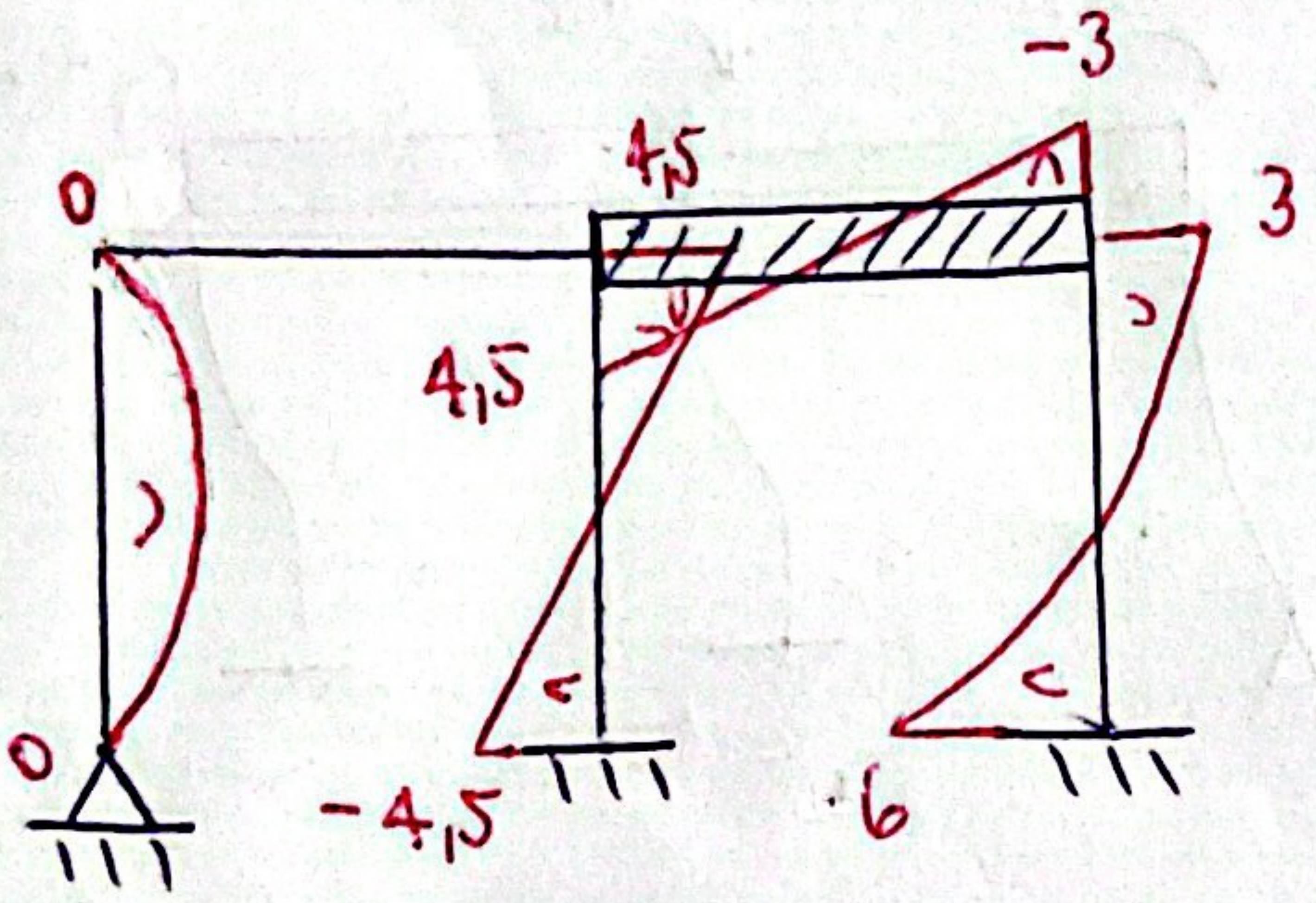


Finalmente, hacemos la superposición y obtenemos, también, N(x).

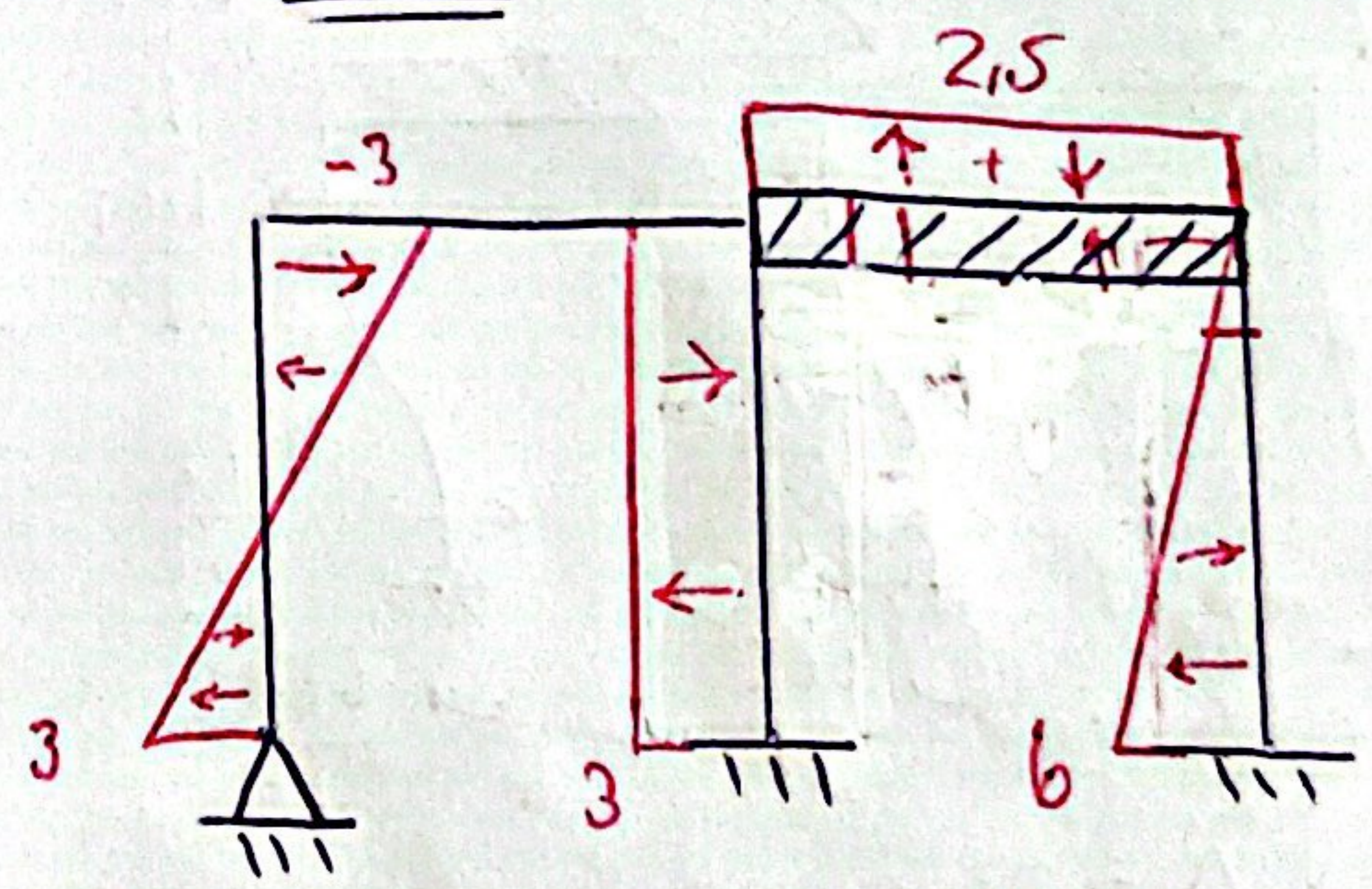
OBS: M(x) convención.



$M_F(x)$:

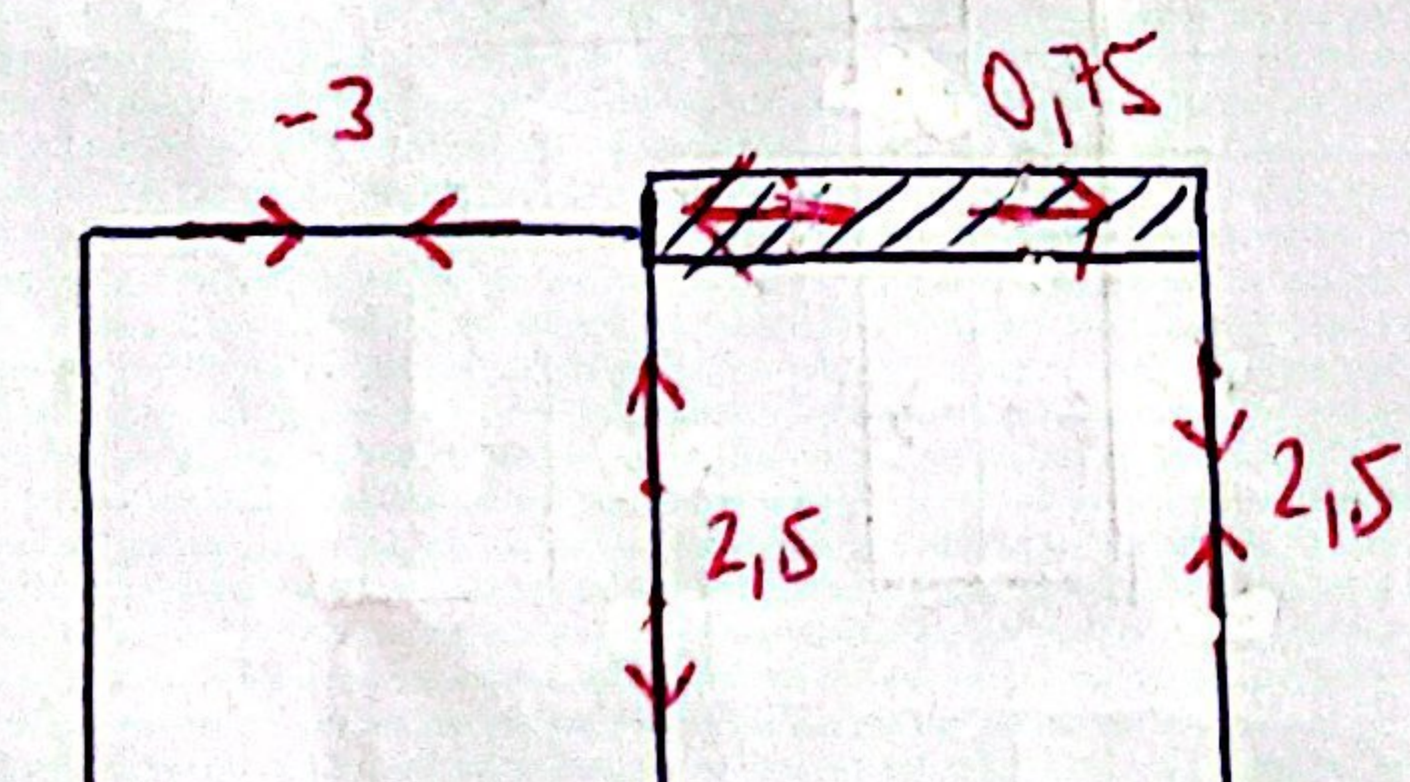


$Q_F(x)$



OBS: Recordar que $\underbrace{\frac{dM(x)}{dx}}_{m = \frac{\Delta y}{\Delta x} = \frac{4,5-(-3)}{3}} = Q(x)$.

$N_F(x)$:



Reacciones