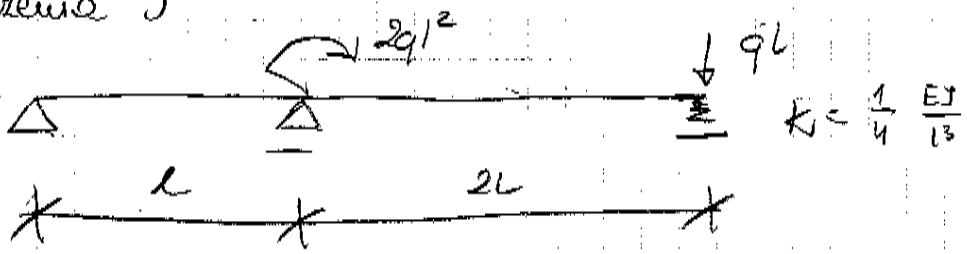
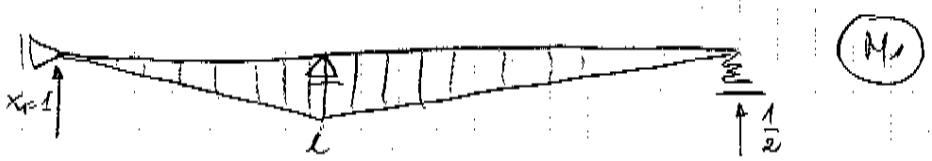
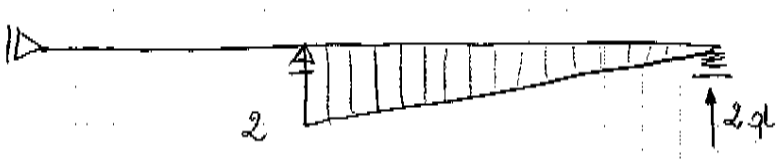
Ćwiczenia 5



$k = \frac{1}{4}\frac{EJ}{l^3}$





$$\delta_{ij} = \sum \int \frac{M_i M_j}{EJ} dx + \frac{1}{k} \cdot R_i \cdot R_j$$

$$x_1 = -\frac{\Delta_{1P}}{\delta_{11}}$$

$$\delta_{11} = \frac{1}{EJ}\left[\frac{1}{2}\cdot l \cdot l \cdot \frac{2}{3}l + \frac{1}{2}\cdot l \cdot 2l \cdot \frac{2}{3}l\right] + \frac{1}{\frac{1}{4}} \cdot \frac{1}{2}\cdot\frac{1}{2} = 2\frac{l^3}{EJ}$$

$$\Delta_{1P} = \frac{1}{EJ}\left[\frac{1}{2}\cdot 2ql^2 \cdot 2l \cdot \frac{2}{3}\cdot l\right] + \frac{1}{\frac{1}{4}} \cdot 2ql \cdot \frac{1}{2} = \frac{16}{3}\frac{ql^4}{EJ}$$

$$x_1 = -\frac{8}{3}ql$$