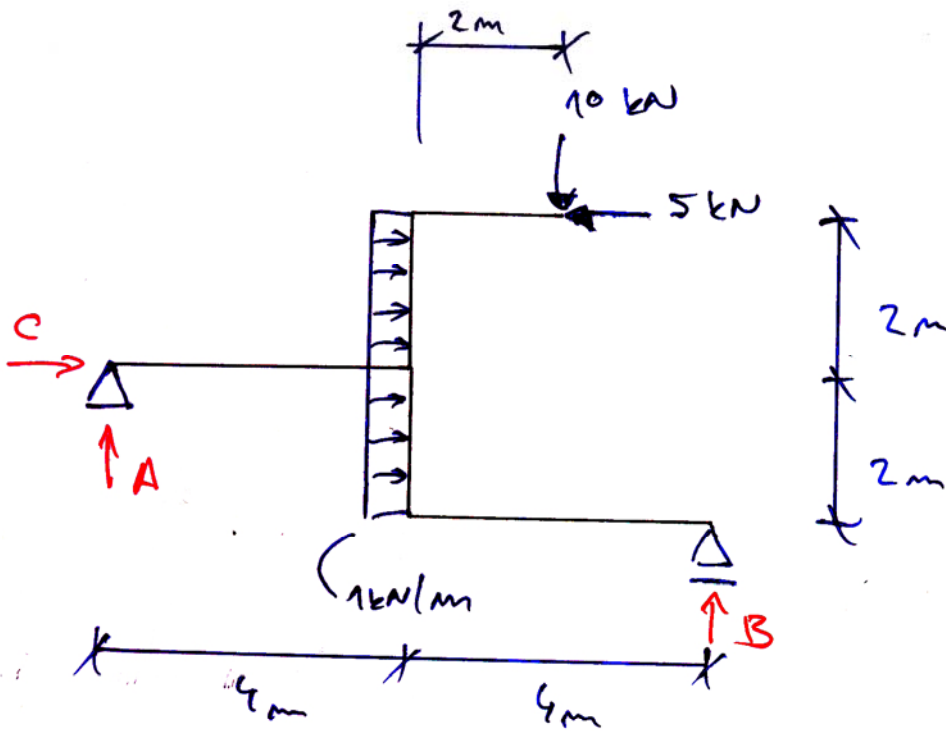


Na rozhraní

SFB, cv. 12, str 0

Vyřešte a zkraslete problémy vnitřních síl a reakce na zadané konstrukci!



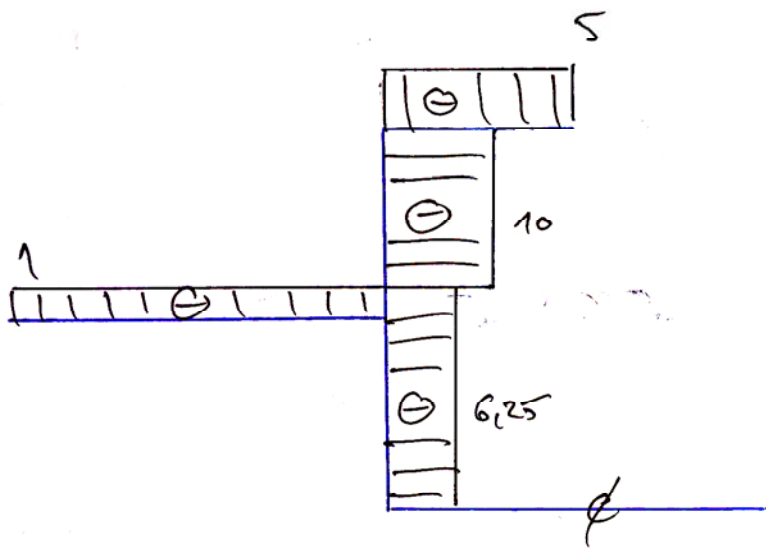
$$C = 1 \text{ kN}$$

$$A + B = 10$$

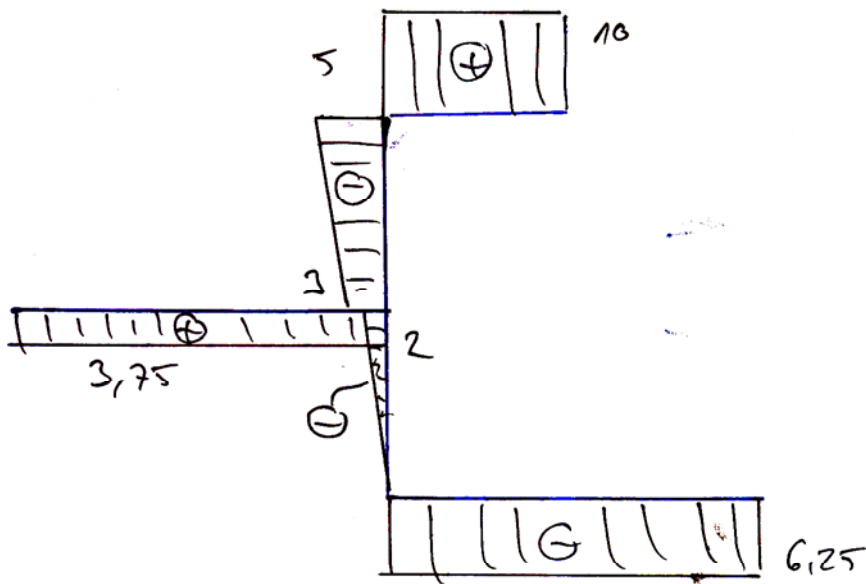
$$8 \cdot A = 5 \cdot 4 + 2 \cdot 10 - 2 \cdot 4 - 2 \cdot 1$$

$$\Rightarrow A = 3,75 \text{ kN}$$

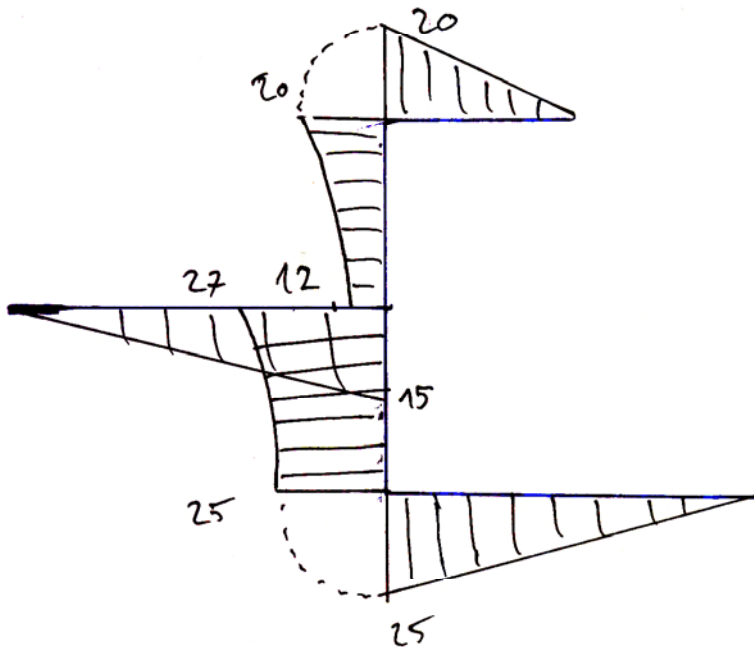
$$B = 6,25 \text{ kN}$$



$N [kN]$



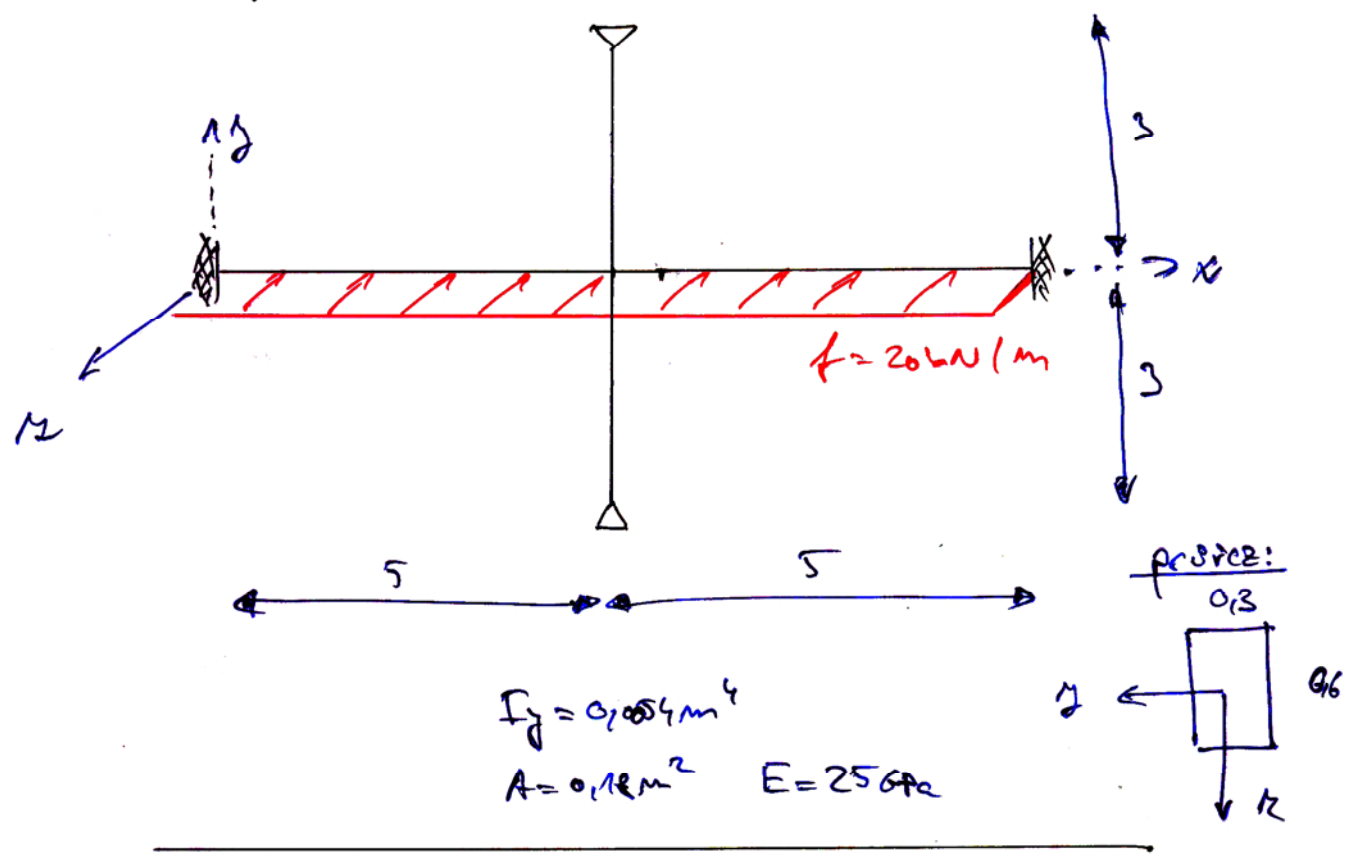
$V [kN]$



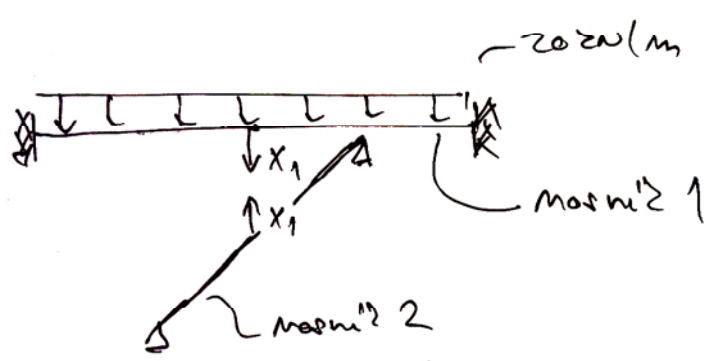
$M [kNm]$

Příklad 1

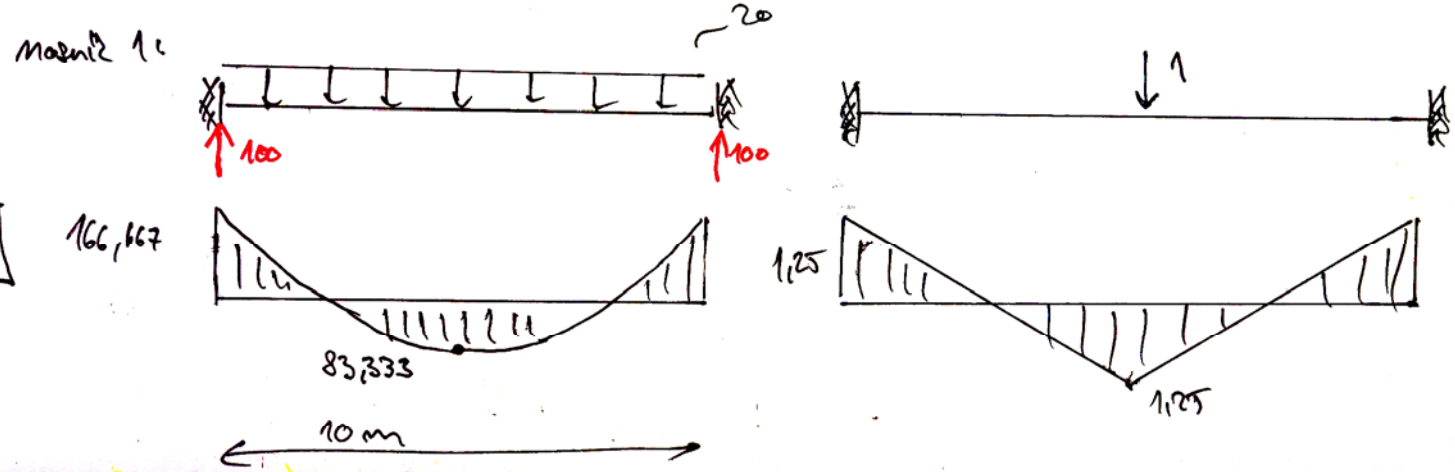
Vyřešte problém uvnitřních sil a reakce na zadané konstrukci.
Zanedbnějte vliv kroucení a členy spojené se smyčkovou a normálovou deformací!

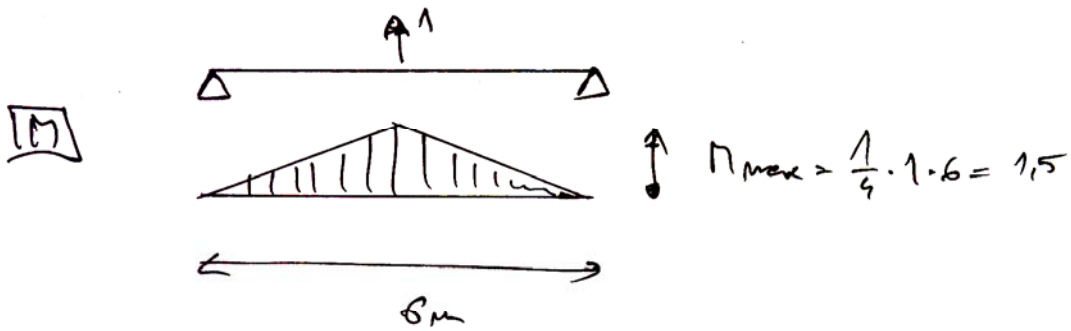


• Danou konstrukci si rozdělíme na dvě části, zavoláme 1 smyčkovou X_1

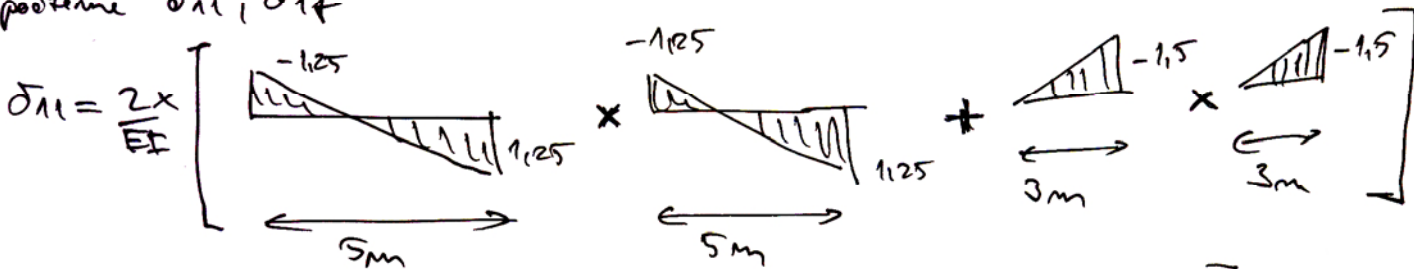


• Urdíme problémy uvnitřních sil:





⊙ Hypothesen δ_{11}, δ_{14}

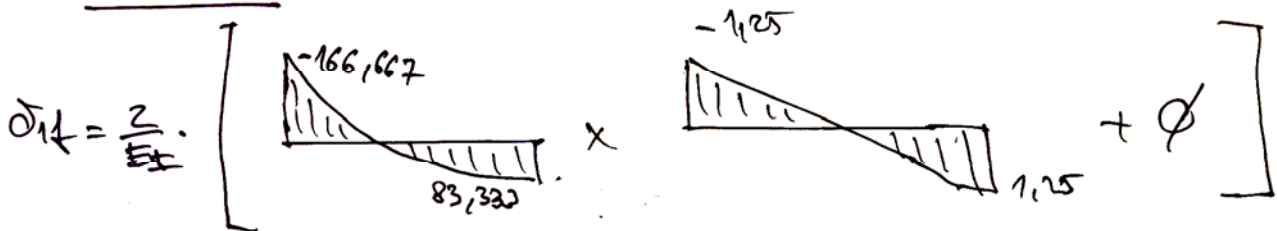


$$\delta_{11} = \frac{2x}{EI} \left[\frac{5}{6} \left[(-1,25)(2 \cdot (-1,25) + 1,25) + 1,25(2 \cdot 1,25 - 1,25) \right] + \frac{1}{3} (-1,5)(1,5) \cdot 3 \right]$$

$(-1,25)^2$
 $1,25^2$
 $2,25$

$2,60417$

$= 9,708 / EI$



$$\delta_{14} = \frac{2}{EI} \cdot \left[\text{trapezoid} \times \text{trapezoid} + \text{rectangle} \times \text{trapezoid} \right] =$$

$$= \frac{2}{EI} \left[\frac{1}{12} (1,25 - 3 \cdot 1,25) (-250) \cdot 5 + \frac{1}{2} \cdot (-1,25 + 1,25) \cdot 83,333 \cdot 5 \right] =$$

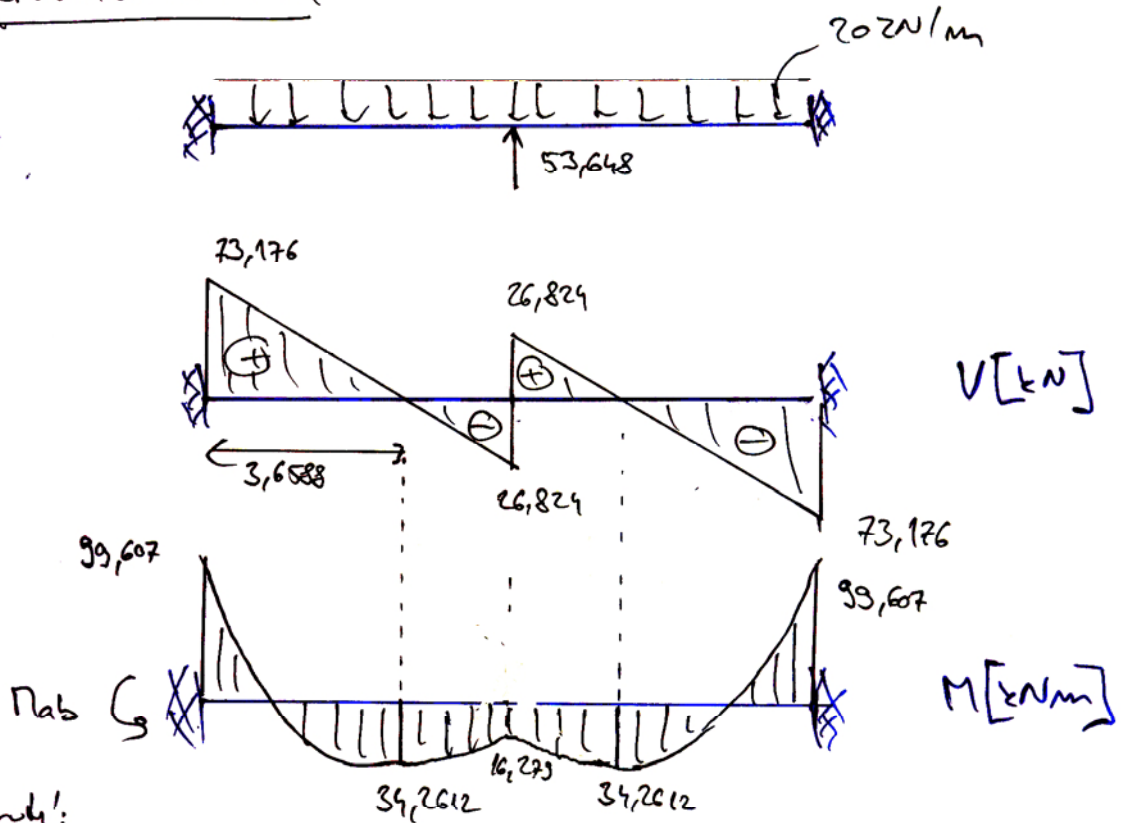
$= \frac{520,833}{EI}$

rovnice $\delta_{11} X_1 = -\delta_{1f}$

$$\Rightarrow X_1 = -\frac{\delta_{1f}}{\delta_{11}} = -\frac{520,833}{9,708} = -53,648 \text{ kN}$$

5) Výsledky / průběh užitíých sil

Návrh 1:



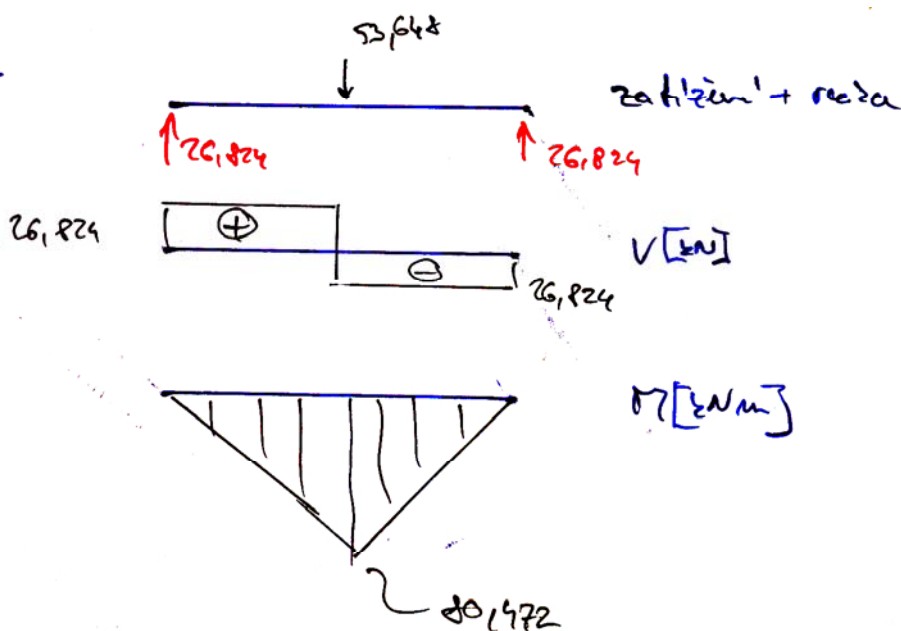
Moment reaktive!

$$N_{ab} = -\frac{53,648 \cdot 10}{8} + \frac{1}{12} \cdot 20 \cdot 10^2 = 99,607 \text{ kNm}$$

$$-99,607 + 73,176 \cdot 3,6588 - 20 \cdot 3,6588^2 / 2 = 34,2612 \text{ kNm}$$

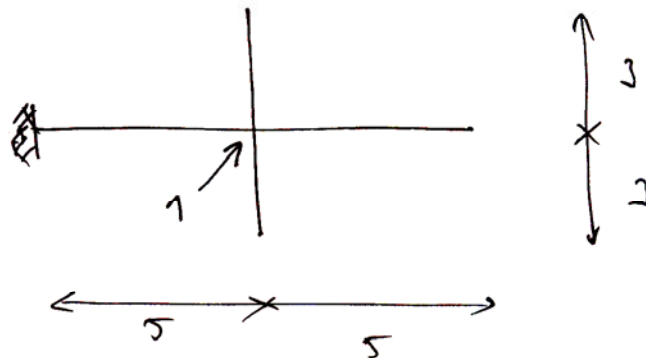
$$-99,607 + 73,176 \cdot 5 - 20 \cdot 5^2 / 2 = 16,273 \text{ kNm}$$

Návrh 2:

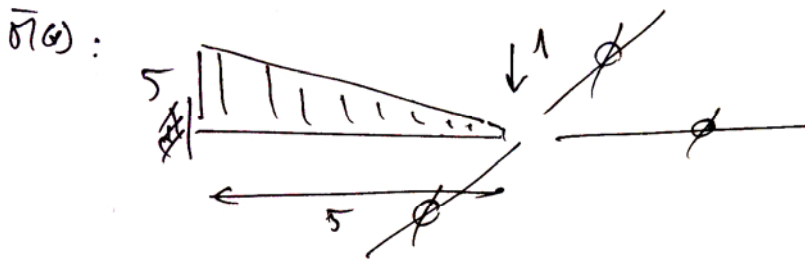


Na skjele kontrolni u prostoku prehyb n
 m'elo krit'cem' nasti'zo!

Vrednotnu' Atoz:



$$\int_0^L \bar{\pi}(x) \pi(x) dx = 1 \cdot 105$$

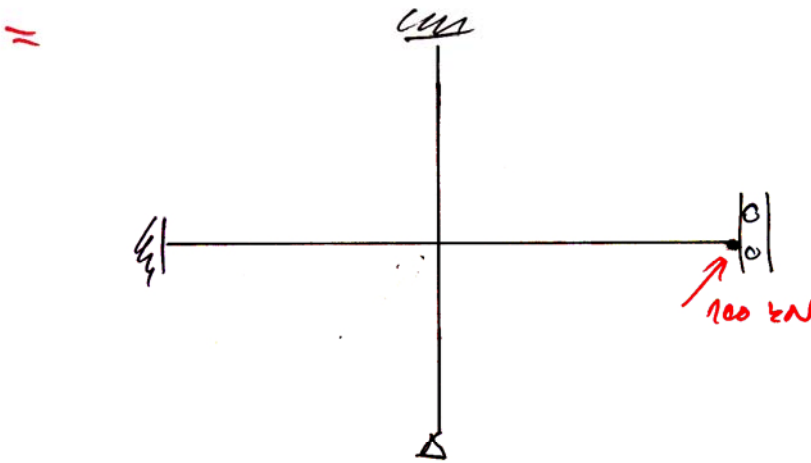
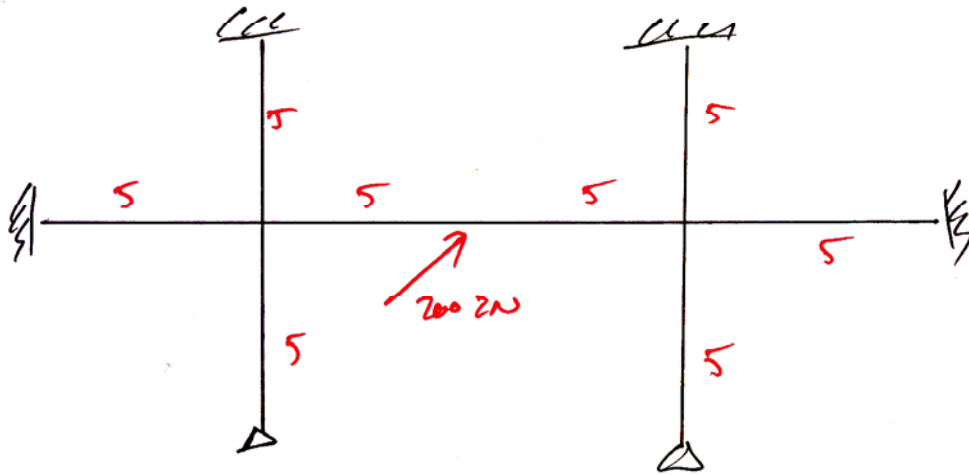


$$\bar{\pi}(x) = -5 + x$$

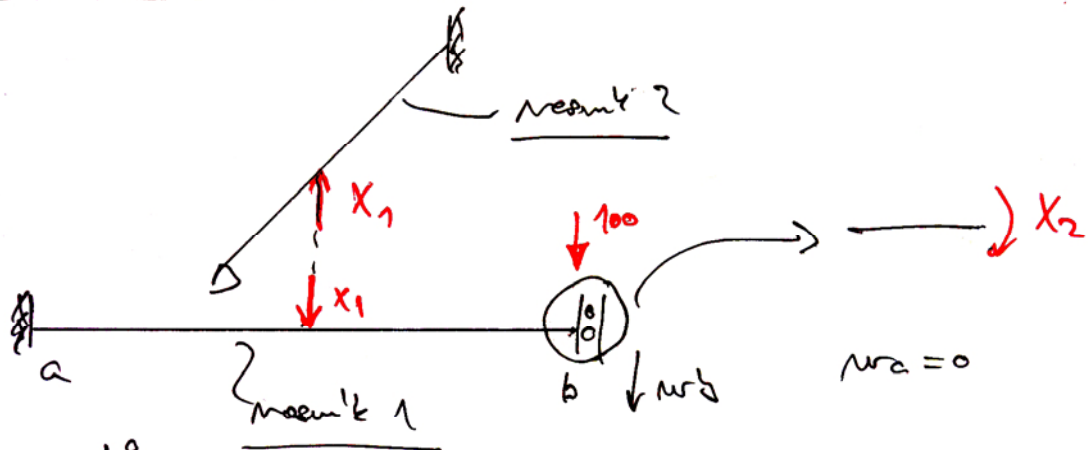
$$\pi(x) = -99,607 + 73,176 \cdot x - 20 \frac{x^2}{2}$$

$$\int_0^L \frac{\bar{\pi}(x) \pi(x) dx}{EI} = \int_0^5 \frac{(-5+x)(-99,607 + 73,176x - 10x^2) dx}{25000 \cdot 0,054} =$$

$$= \frac{\left[-\frac{5}{2} x^4 + 41,0587 x^3 - 232,744 x^2 + 498,035 x \right]_0^5}{EI} = \frac{291,4208}{135} = \underline{\underline{17883 \text{ mm}}}$$

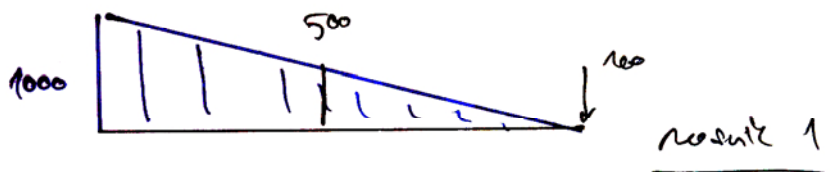


Uscit protih uibraci dle sil

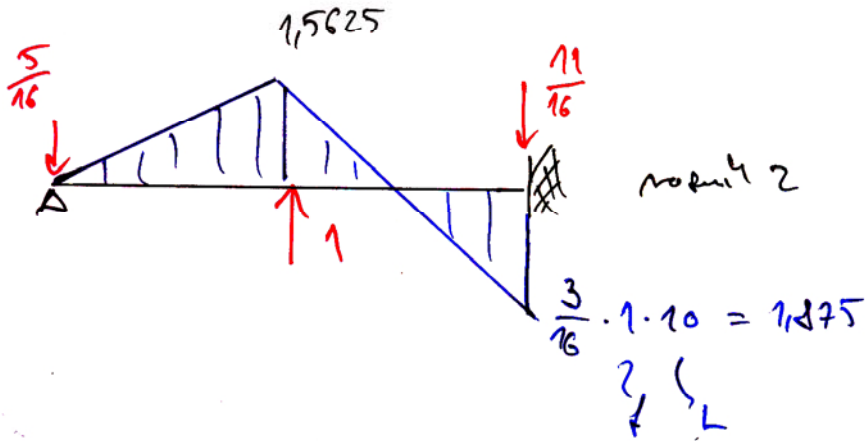
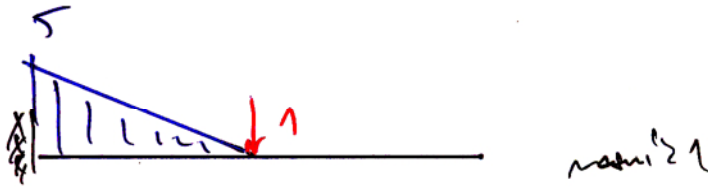


prubn momenty

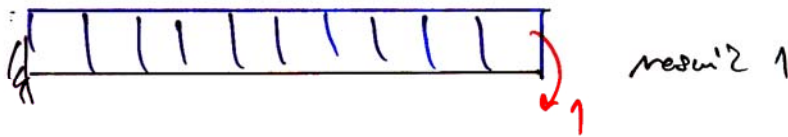
od [A]



oad X_1



oad X_2



Uypodet velicitin δ_{ij}, δ_{if}

$$\delta_{11} = \left[\begin{array}{c} 5 \\ \triangle \\ 5 \end{array} \times \begin{array}{c} 5 \\ \triangle \\ 5 \end{array} + \begin{array}{c} -1.5625 \\ \triangle \\ 5 \end{array} \times \begin{array}{c} -1.5625 \\ \triangle \\ 5 \end{array} + \begin{array}{c} -1.5625 \\ \triangle \\ 1.875 \end{array} \times \begin{array}{c} -1.5625 \\ \triangle \\ 1.875 \end{array} \right] \cdot EI$$

$$= \left[\frac{1}{3} \cdot 5^2 \cdot 5 + \frac{1}{3} \cdot 1.5625^2 \cdot 5 + \frac{5}{2} \left[\underbrace{-1.5625 (2 \cdot (-1.5625) + 1.875)}_{1.9531} + \underbrace{1.875 (2 \cdot 1.875 - 1.5625)}_{9.1016} \right] \right] \cdot EI$$

$$= \frac{41.667 + 4.0691}{EI} + 5.04557 = \underline{\underline{\frac{50.7813}{EI}}}$$

$$\delta_{12} = \frac{1}{EI} \left[\begin{array}{c} -5 \\ \triangle \\ 5 \end{array} \times \begin{array}{c} -1 \\ \square \\ 5 \end{array} \right] = \left[\frac{5}{2}(-5)(-1) \right] : EI = \underline{\underline{\frac{12,5}{EI}}}$$

$$\delta_{22} = \frac{1}{EI} \left[\begin{array}{c} \longleftarrow 10 \\ \square \\ -1 \end{array} \times \begin{array}{c} \longrightarrow 10 \\ \square \\ -1 \end{array} \right] = \underline{\underline{\frac{10}{EI}}}$$

$$\delta_{14} = \frac{1}{EI} \left[\begin{array}{c} -5 \\ \triangle \\ 5 \end{array} \times \begin{array}{c} -1000 \\ \square \\ 5 \end{array} \right] = \frac{1}{EI} \cdot \frac{1}{6} (-5)(2 \cdot (-1000) - 500) \cdot 5 =$$

$$= \underline{\underline{10 \cdot 416,7 / EI}}$$

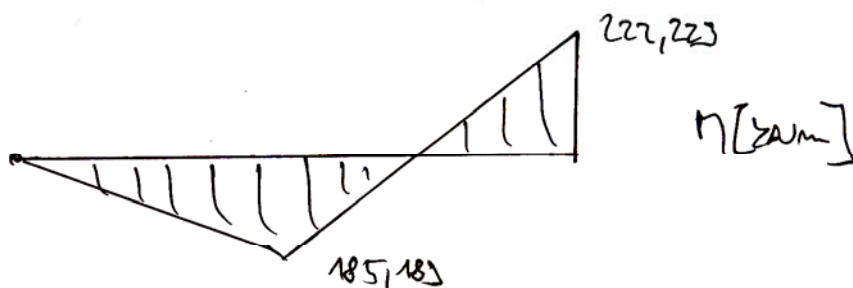
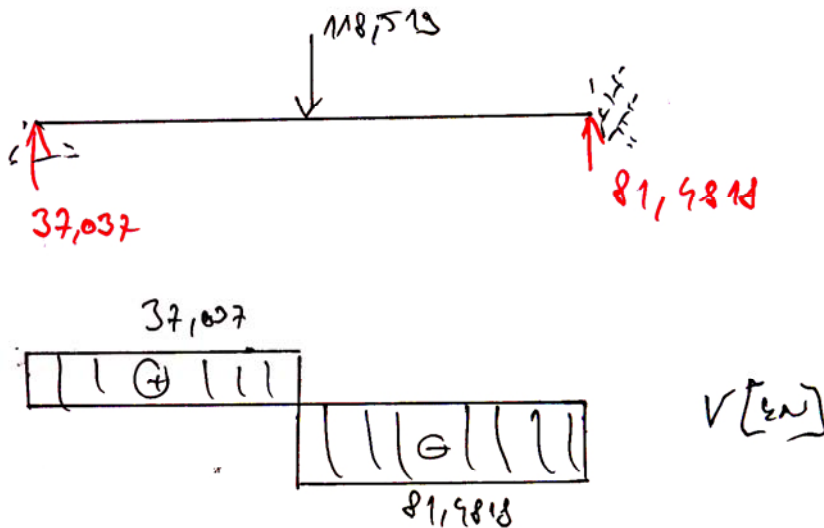
$$\delta_{24} = \frac{1}{EI} \cdot \left[\begin{array}{c} -1000 \\ \triangle \\ 10 \end{array} \times \begin{array}{c} -1 \\ \square \\ 10 \end{array} \right] = \frac{1}{2} \cdot \frac{(-1000)(-1) \cdot 10}{EI} = \underline{\underline{\frac{5000}{EI}}}$$

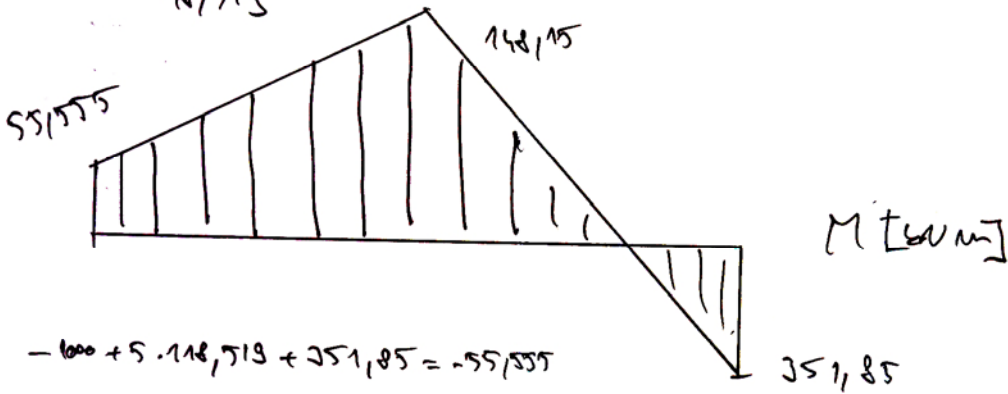
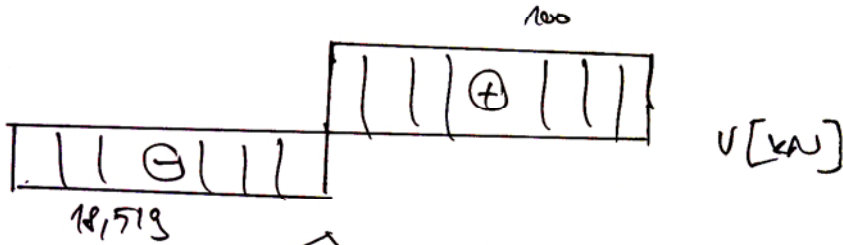
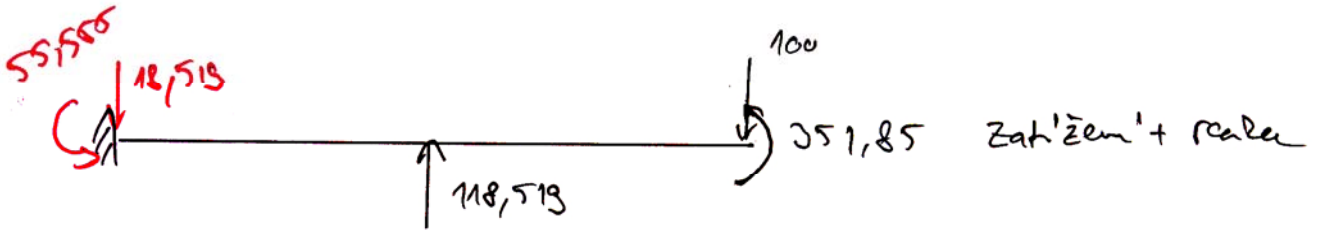
resum: $K_1 = -118,519 \text{ ZAJ}$

$K_2 = -351,85 \text{ ZAJm}$

Vidobnel prô delly untrâmeh orl

Nasmic 2 :





$$-1000 + 5 \cdot 118,519 + 351,85 = -55,555$$

$$-500 + 351,85 = -148,15$$