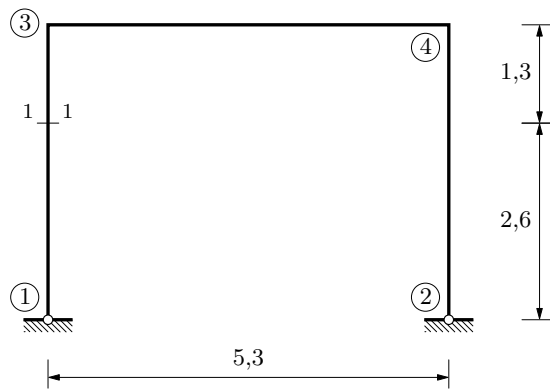
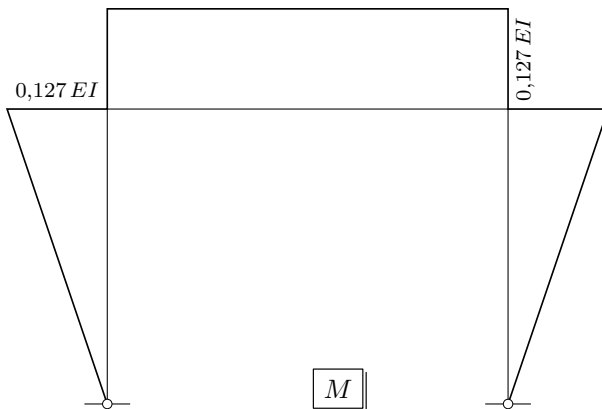
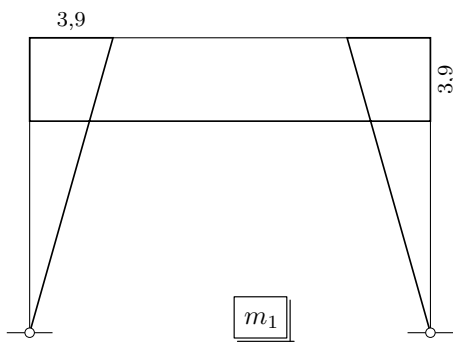
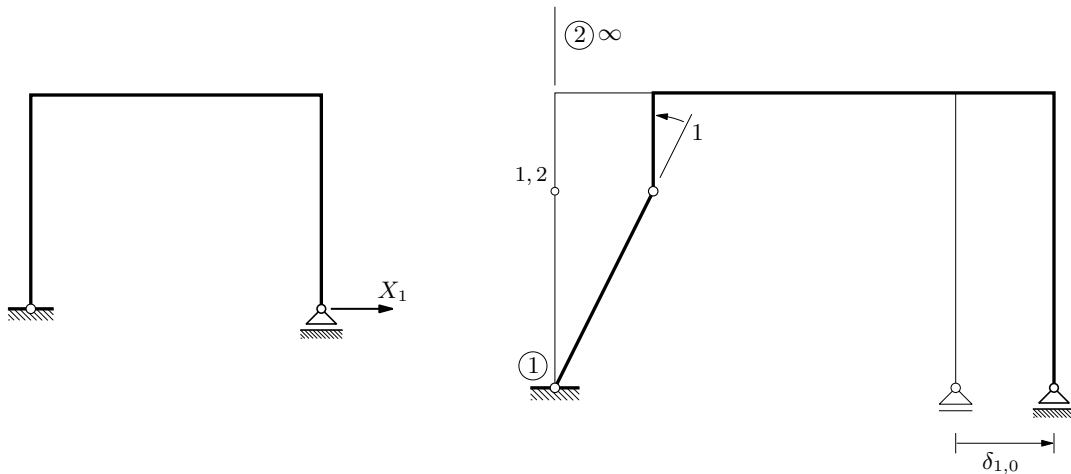




$$\eta_{M_1}$$

$$(EI)_s = EI$$

$$(EI)_g = 2EI$$



$$\delta_{1,0} = 2,6 \cdot 1 = 2,6$$

$$\delta_{1,1} X_1 + \delta_{1,0} = 0$$

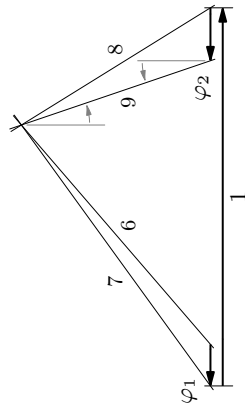
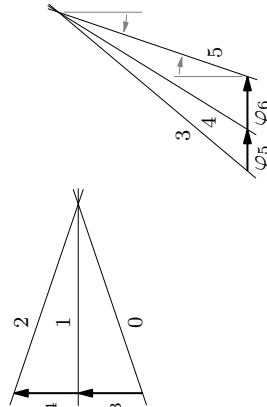
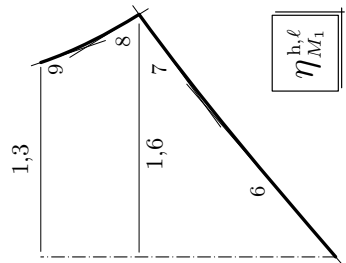
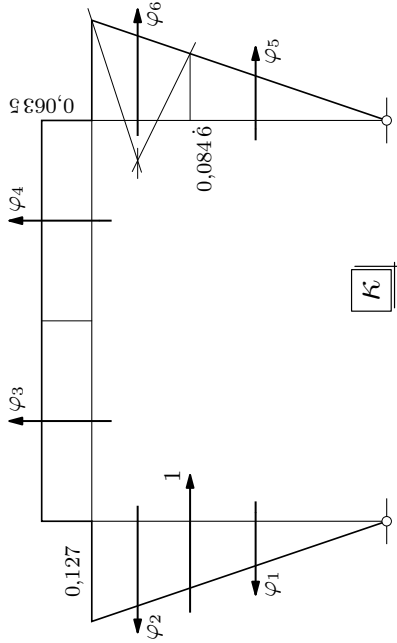
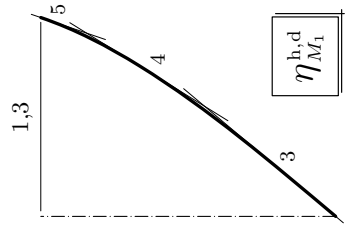
$$\delta_{1,1} X_1 = -\delta_{1,0}$$

$$\begin{aligned} \delta_{1,1} &= \frac{2}{EI} \left(\frac{1}{2} \cdot 3,9 \cdot 3,9 \right) \left(\frac{2}{3} \cdot 3,9 \right) \\ &\quad + \frac{1}{2EI} (3,9 \cdot 5,3) \cdot 3,9 \\ &= \frac{79,8525}{EI} \end{aligned}$$

$$\frac{79,8525}{EI} X_1 = -2,6$$

$$X_1 = -\frac{EI}{30,7125} = -0,03256 EI$$

$$M(x) = X_1 m_1(x)$$



mjerilo duljina: 1 cm :: 1 m

$$\varphi_1 = \varphi_5 = \frac{1}{2} \cdot 0,0846 \cdot 2,6 = 0,110067$$

$$\varphi_2 = \varphi_6 = \frac{1}{2} \cdot 0,0846 \cdot 1,3 + \frac{1}{2} \cdot 0,127 \cdot 1,3 = 0,137583$$

$$\varphi_3 = \varphi_4 = 0,0635 \cdot 2,65 = 0,168275$$

mjerilo kutova: 1 cm :: 0,2

$$\tilde{\varphi}_1 = \tilde{\varphi}_5 = 0,55 \text{ cm}$$

$$\tilde{\varphi}_2 = \tilde{\varphi}_6 = 0,7 \text{ cm}$$

$$\tilde{\varphi}_3 = \tilde{\varphi}_4 = 0,85 \text{ cm}$$

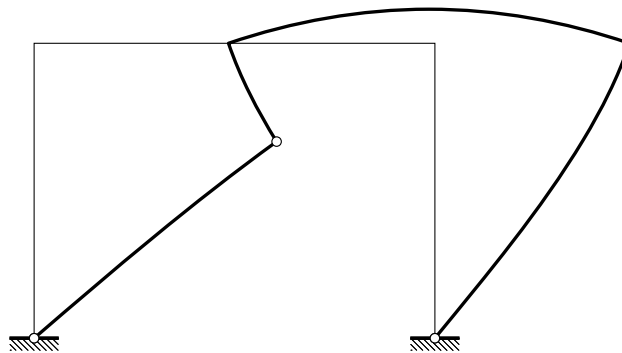
$$\tilde{l} = 5 \text{ cm}$$

$$\tilde{\chi} = 2,5 \text{ cm} \quad \Rightarrow \quad \chi = \frac{1}{2} \quad \mathcal{E} \quad n = 2$$

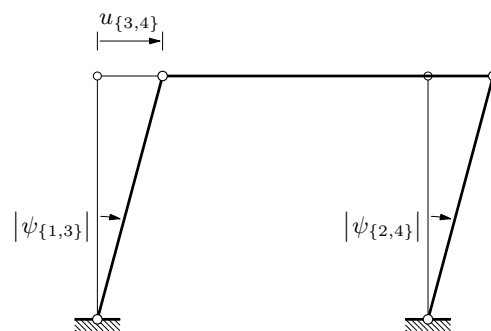
$$\tilde{\eta}_3^h = 2,6 \text{ cm} \quad \Rightarrow \quad \eta_3^h = 1,3$$

$$\tilde{\eta}_4^h = 2,6 \text{ cm} \quad \Rightarrow \quad \eta_4^h = 1,3$$

skica progibne linije, zora radi:



izračunavanje vrijednosti za crtanje momentnoga dijagrama metodom pomaka:



nepoznanice: φ_3, φ_4 i $u_{3,4}$

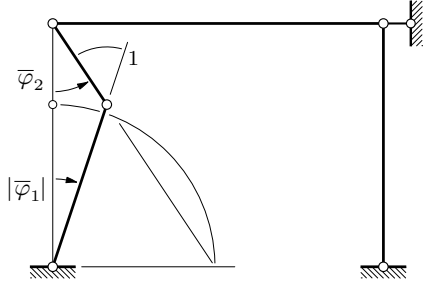
$$\psi_{1,3} = \psi_{2,4} = -\frac{u_{3,4}}{3,9}$$

$$M_{3,1} = 3k_{\{1,3\}}\varphi_3 - 3k_{\{1,3\}}\psi_{\{1,3\}} + \bar{M}_{3,1} = 3k_{\{1,3\}}\varphi_3 + 3k_{\{1,3\}}\frac{u_{\{3,4\}}}{3,9} + \bar{M}_{3,1}$$

$$M_{4,2} = 3k_{\{2,4\}}\varphi_4 - 3k_{\{2,4\}}\psi_{\{2,4\}} + \bar{M}_{4,2} = 3k_{\{2,4\}}\varphi_4 + 3k_{\{2,4\}}\frac{u_{\{3,4\}}}{3,9} + \bar{M}_{4,2}$$

$$M_{3,4} = 4k_{\{3,4\}}\varphi_3 + 2k_{\{3,4\}}\varphi_4 + \bar{M}_{3,4}$$

$$M_{4,3} = 4k_{\{3,4\}}\varphi_4 + 2k_{\{3,4\}}\varphi_3 + \bar{M}_{4,3}$$



$$\bar{\varphi}_1 = -\frac{1,3}{3,9} = -\frac{1}{3}$$

$$\bar{\varphi}_2 = \frac{2,6}{3,9} = \frac{2}{3}$$

$$\bar{M}_{3,1} = -3k_{\{1,3\}}\bar{\varphi}_2 = -3k_{\{1,3\}}\frac{2}{3} = -2k_{\{1,3\}}$$

$$-M_{3,1} - M_{3,4} = 0 \quad \Rightarrow \quad M_{3,1} + M_{3,4} = 0$$

$$\left[3k_{\{1,3\}}\varphi_3 + 3k_{\{1,3\}}\frac{u_{\{3,4\}}}{3,9} + \bar{M}_{3,1} \right] + \left[4k_{\{3,4\}}\varphi_3 + 2k_{\{3,4\}}\varphi_4 \right] = 0$$

$$(3k_{\{1,3\}} + 4k_{\{3,4\}})\varphi_3 + 2k_{\{3,4\}}\varphi_4 + 3k_{\{1,3\}}\frac{u_{\{3,4\}}}{3,9} = -\bar{M}_{3,1}$$

$$\left(3 \cdot \frac{EI}{3,9} + 4 \cdot \frac{2EI}{5,3} \right) \varphi_3 + 2 \cdot \frac{2EI}{5,3} \cdot \varphi_4 + 3 \cdot \frac{EI}{3,9} \cdot \frac{u_{\{3,4\}}}{3,9} = 2 \cdot \frac{EI}{3,9}$$

$$2,278\,66\varphi_3 + 0,754\,717\varphi_4 + 0,197\,239u_{\{3,4\}} = 0,512\,821$$

$$-M_{4,3} - M_{4,2} = 0 \quad \Rightarrow \quad M_{4,3} + M_{4,2} = 0$$

$$\left[2k_{\{3,4\}}\varphi_3 + 4k_{\{3,4\}}\varphi_4 \right] + \left[3k_{\{2,4\}}\varphi_4 + 3k_{\{2,4\}}\frac{u_{\{3,4\}}}{3,9} \right] = 0$$

$$2k_{\{3,4\}}\varphi_3 + (3k_{\{2,4\}} + 4k_{\{3,4\}})\varphi_4 + 3k_{\{2,4\}}\frac{u_{\{3,4\}}}{3,9} = 0$$

$$2 \cdot \frac{2EI}{5,3} \cdot \varphi_3 + \left(3 \cdot \frac{EI}{3,9} + 4 \cdot \frac{2EI}{5,3} \right) \varphi_4 + 3 \cdot \frac{EI}{3,9} \cdot \frac{u_{\{3,4\}}}{3,9} = 0$$

$$0,754\,717\varphi_3 + 2,278\,66\varphi_4 + 0,197\,239u_{\{3,4\}} = 0$$

$$M_{3,1}\delta\psi_{\{1,3\}} + M_{4,2}\delta\psi_{\{2,4\}} = 0$$

$$\left[3k_{\{1,3\}}\varphi_3 + 3k_{\{1,3\}}\frac{u_{\{3,4\}}}{3,9} + \bar{M}_{3,1} \right] \left(-\frac{\delta u_{\{3,4\}}}{3,9} \right) + \left[3k_{\{2,4\}}\varphi_4 + 3k_{\{2,4\}}\frac{u_{\{3,4\}}}{3,9} \right] \left(-\frac{\delta u_{\{3,4\}}}{3,9} \right) = 0$$

$$\frac{1}{3,9} \cdot 3 \cdot \frac{EI}{3,9} \cdot \varphi_3 + \frac{1}{3,9} \cdot 3 \cdot \frac{EI}{3,9} \cdot \varphi_4 + \frac{1}{3,9} \cdot 6 \cdot \frac{EI}{3,9} \cdot \frac{u_{\{3,4\}}}{3,9} = -\frac{1}{3,9} \left(-2 \cdot \frac{EI}{3,9} \right)$$

$$0,197\,239 \varphi_3 + 0,197\,239 \varphi_4 + 0,101\,148 u_{\{3,4\}} = 0,131\,492$$

$$2,278\,66 \varphi_3 + 0,754\,717 \varphi_4 + 0,197\,239 u_{\{3,4\}} = 0,512\,821$$

$$0,754\,717 \varphi_3 + 2,278\,66 \varphi_4 + 0,197\,239 u_{\{3,4\}} = 0$$

$$0,197\,239 \varphi_3 + 0,197\,239 \varphi_4 + 0,101\,148 u_{\{3,4\}} = 0,131\,492$$

$$\varphi_3 = 0,168\,255, \quad \varphi_4 = -0,168\,255 \quad \mathcal{E} \quad u_{\{3,4\}} = 1,30$$

(kut φ_3 jednak je (gotovo, uz grešku zaokruživanja) kutu φ_3 na stranicama 2 i 3;
isto je tako $|\varphi_4|$ jednak kutu φ_4 , dok je duljina $u_{\{3,4\}}$ jednaka duljinama η_3^h i η_4^h)

$$M_{3,1} = \frac{3EI}{3,9} \cdot 0,168\,255 + \frac{3EI}{3,9} \cdot \frac{1,30}{3,9} - \frac{2EI}{3,9} = -0,126\,983 EI$$

$$M_{4,2} = \frac{3EI}{3,9} \cdot (-0,168\,255) + \frac{3EI}{3,9} \cdot \frac{1,30}{3,9} = 0,126\,983 EI$$

$$M_{3,4} = \frac{8EI}{5,3} \cdot 0,168\,255 + \frac{4EI}{5,3} \cdot (-0,168\,255) = 0,126\,985 EI$$

$$M_{4,3} = \frac{4EI}{5,3} \cdot 0,168\,255 + \frac{8EI}{5,3} \cdot (-0,168\,255) = -0,126\,985 EI$$

(„neravnoteža” je posljedica grešaka zaokruživanja)

dijagram je prikazan na najdonjoj slici na stranici 1