

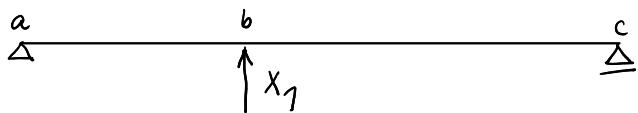
Řešte silovou metodou:

$$E = 30 \text{ GPa}$$

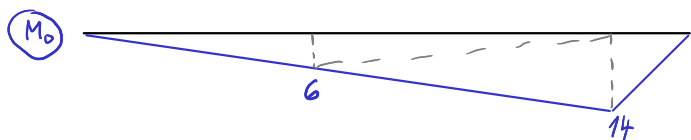
$$I = 5 \cdot 10^{-4} \text{ m}^4$$

1. VARIANTA:

ZSUS:



0. ZS:



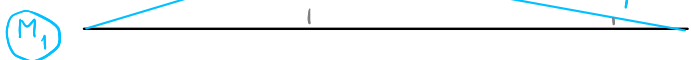
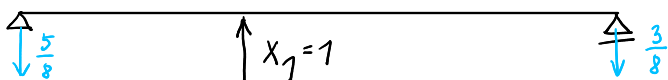
-kanonické (deformační) rovnice

$$\delta_{1,1} \cdot X_1 + \delta_{1,0} = 0 \quad (w_b = 0)$$

$$\delta_{1,1} = \int \frac{M_1 M_1}{EI} ds =$$

$$= \frac{1}{EI} \left\{ \left(\frac{1}{2} \cdot (-1,875) \cdot 3 \right) \cdot \left[\frac{2}{3} \cdot (-1,875) \right] + \left(\frac{1}{2} \cdot (-1,875) \cdot 5 \right) \cdot \left[\frac{2}{3} \cdot (-1,875) \right] \right\} = \frac{9,375}{EI}$$

1. ZS:

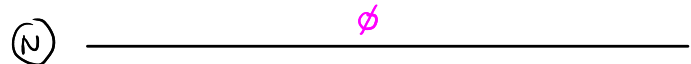
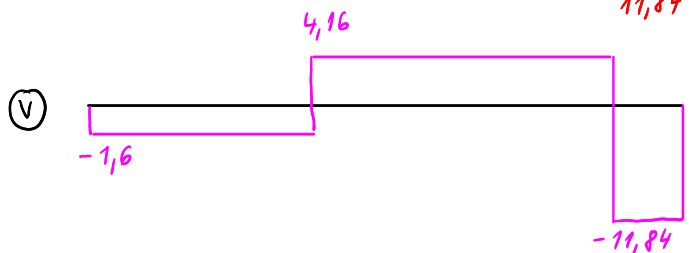
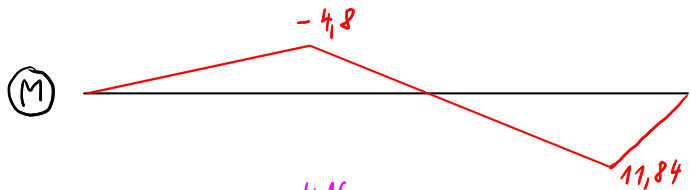
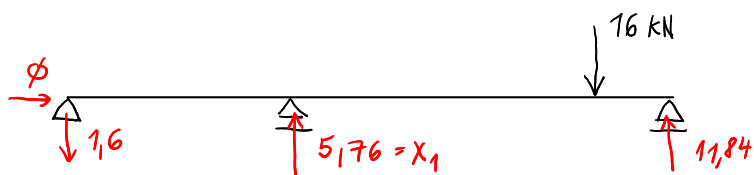


$$\delta_{1,0} = \int \frac{M_1 M_0}{EI} ds =$$

$$= \frac{1}{EI} \left\{ \left(\frac{1}{2} \cdot 6 \cdot 3 \right) \cdot \left[\frac{2}{3} \cdot (-1,875) \right] + \left(\frac{1}{2} \cdot 6 \cdot 4 \right) \cdot \left[\frac{2}{3} \cdot (-1,875) + \frac{1}{3} \cdot (-0,375) \right] + \left(\frac{1}{2} \cdot 14 \cdot 4 \right) \cdot \left[\frac{2}{3} \cdot (-1,875) + \frac{2}{3} \cdot (-0,375) \right] + \left(\frac{1}{2} \cdot 14 \cdot 1 \right) \cdot \left[\frac{2}{3} \cdot (-0,375) \right] \right\} = \frac{-54}{EI}$$

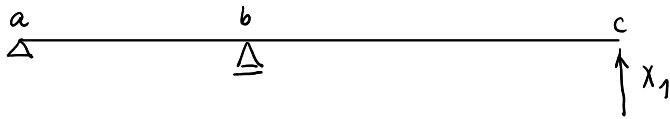
$$\frac{9,375}{EI} \cdot X_1 - \frac{54}{EI} = 0 \quad | \cdot EI$$

$$X_1 = \frac{54}{9,375} = 5,76 \text{ kN}$$



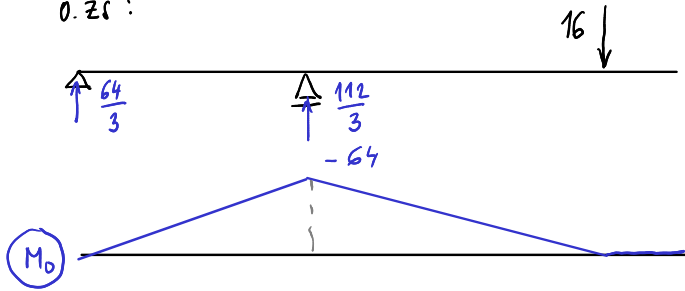
2. VARIANTA:

ZSVS:



-kanonické (deformační) rovnice
 $\delta_{1,1} \cdot X_1 + \delta_{1,0} = 0$ ($w_c = 0$)

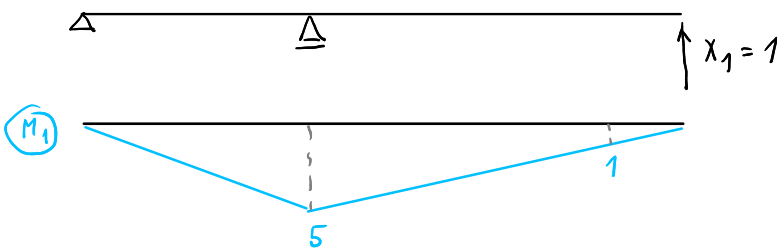
0. ZS:



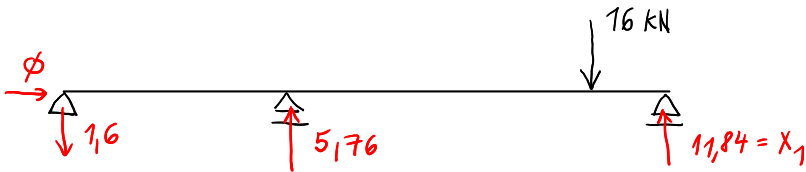
$$\delta_{1,1} = \int \frac{M_1 M_1}{EI} ds = \frac{1}{EI} \left\{ \left(\frac{1}{2} \cdot 5 \cdot 3 \right) \left[\frac{2}{3} \cdot 5 \right] + \left(\frac{1}{2} \cdot 5 \cdot 5 \right) \cdot \left[\frac{2}{3} \cdot 5 \right] \right\}$$

$$= \frac{200}{3EI}$$

1. ZS:

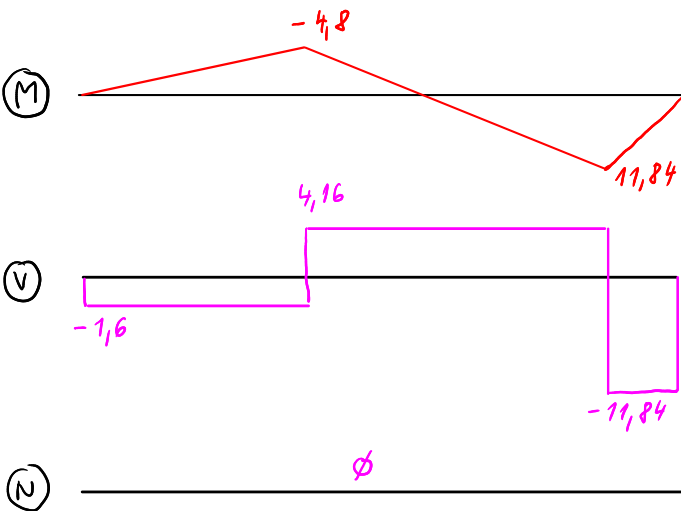


$$\delta_{1,0} = \int \frac{M_1 M_0}{EI} ds = \frac{1}{EI} \left\{ \left(\frac{1}{2} \cdot (-64) \cdot 3 \right) \cdot \left[\frac{2}{3} \cdot 5 \right] + \left(\frac{1}{2} \cdot (-64) \cdot 4 \right) \cdot \left[\frac{2}{3} \cdot 5 + \frac{1}{3} \cdot 7 \right] \right\} = \frac{-2368}{3EI}$$



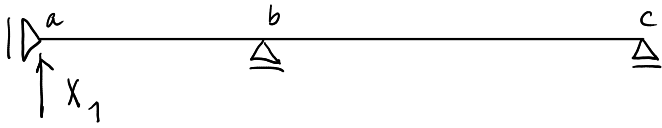
$$\frac{200}{3EI} \cdot X_1 - \frac{2368}{3EI} = 0 \quad | \cdot 3EI$$

$$X_1 = \frac{2368}{200} = 11,84 \text{ kN}$$

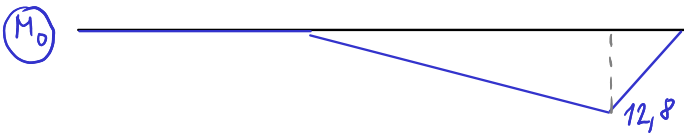
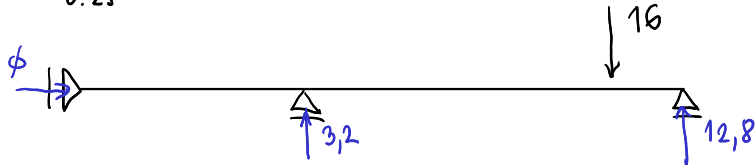


3. VARIANTA

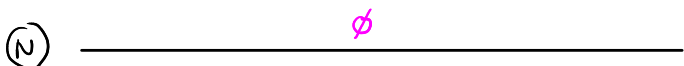
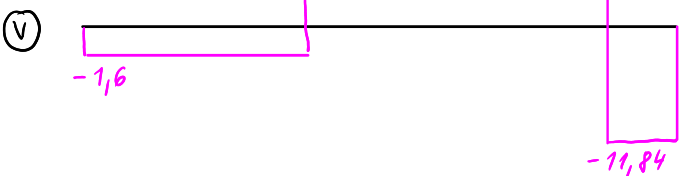
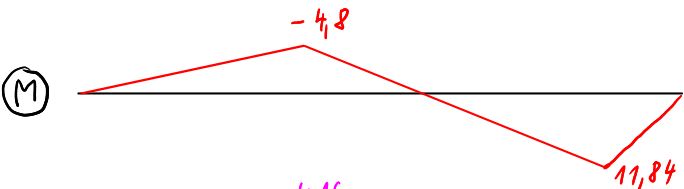
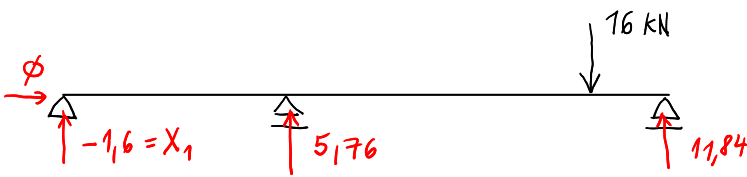
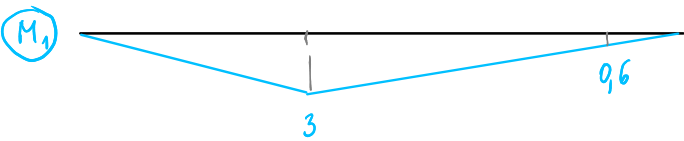
ZSUS:



0. ZS:



1. ZS:



-kanonické (deformační) rovnice
 $\delta_{1,1} \cdot X_1 + \delta_{1,0} = 0$ ($w_a = 0$)

$$\delta_{1,1} = \int \frac{M_1 M_1}{EI} ds = \frac{1}{EI} \left\{ \left(\frac{1}{2} \cdot 3 \cdot 3 \right) \cdot \left[\frac{2}{3} \cdot 3 \right] + \left(\frac{1}{2} \cdot 3 \cdot 5 \right) \cdot \left[\frac{2}{3} \cdot 3 \right] \right\}$$

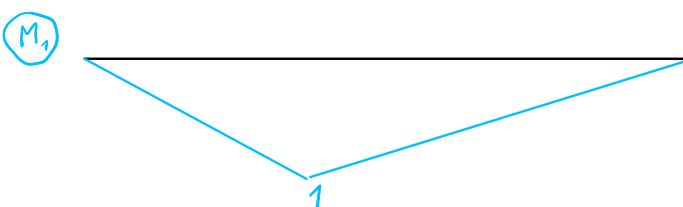
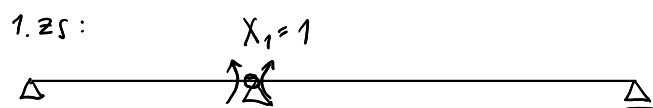
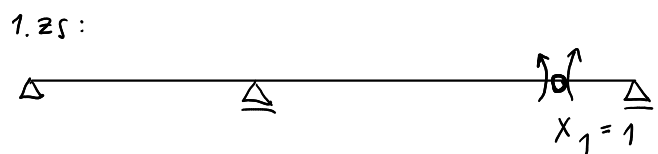
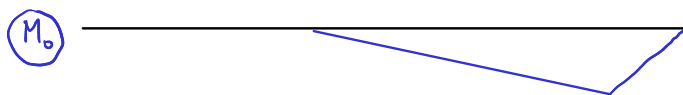
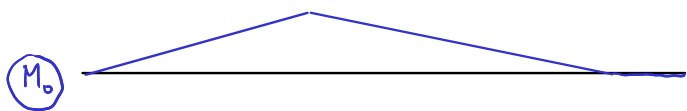
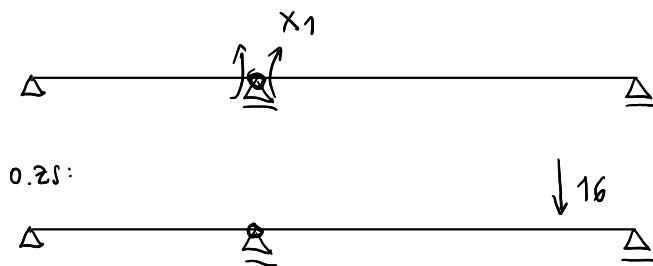
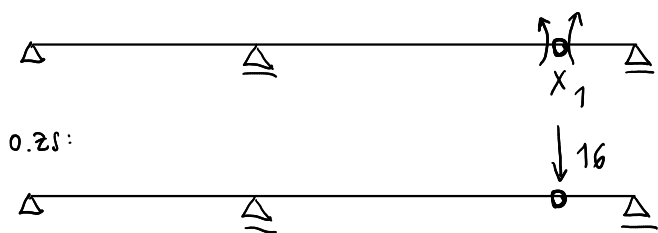
$$= \frac{24}{EI}$$

$$\delta_{1,0} = \int \frac{M_1 M_0}{EI} ds = \frac{1}{EI} \left\{ \left(\frac{1}{2} \cdot 12.8 \cdot 4 \right) \cdot \left[\frac{1}{3} \cdot 3 + \frac{2}{3} \cdot 0.6 \right] + \left(\frac{1}{2} \cdot 12.8 \cdot 1 \right) \cdot \left[\frac{2}{3} \cdot 0.6 \right] \right\} = \frac{38.4}{EI}$$

$$\frac{24}{EI} X_1 + \frac{38.4}{EI} = 0 \quad | \cdot EI$$

$$X_1 = \frac{-38.4}{24} = -1.6 \text{ kN}$$

DALŠÍ MOŽNOSTI ZPUS:



$\Rightarrow X_1 = 11,84 \text{ kNm}$

$\Rightarrow X_1 = -4,8 \text{ kNm}$