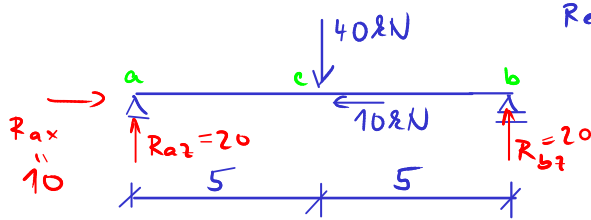


přímé nosníky se spojitým zatížením



Reakce:

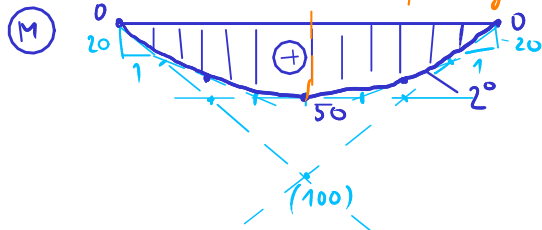
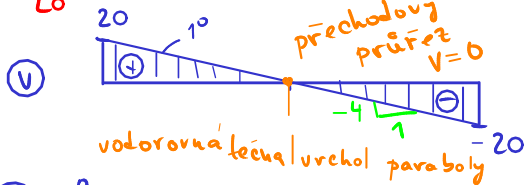
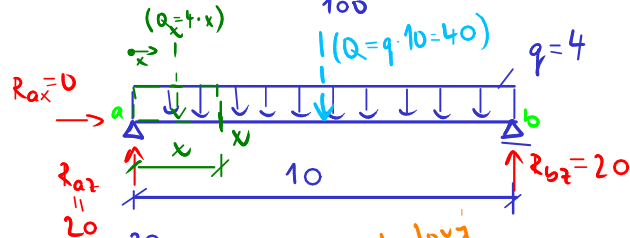
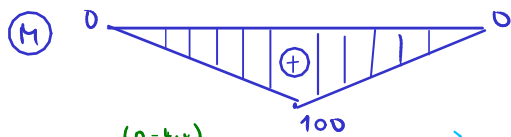
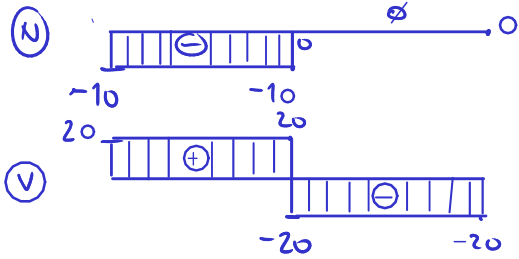
$$\sum F_{xi} = 0 \Rightarrow R_{ax} = 10 \text{ kN}$$

$$\sum M_{ai} = 0 \Rightarrow R_{bz}$$

$$\sum M_{bi} = 0 \Rightarrow R_{az}$$

$$\sum F_{zi} = 0 \text{ kontrola}$$

symetrie $R_{az} = R_{bz} = \frac{40}{2} = 20 \text{ kN}$



Reakce: viz předchozí

$$V_{a-b}(x) = R_{az} - Q_x = R_{az} - 4x = 20 - 4x$$

$$V_{ab} = V_{a-b}(x=0) = 20 - 4 \cdot 0 = 20 \text{ kN}$$

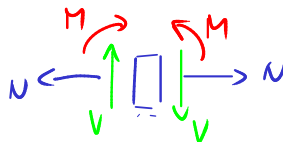
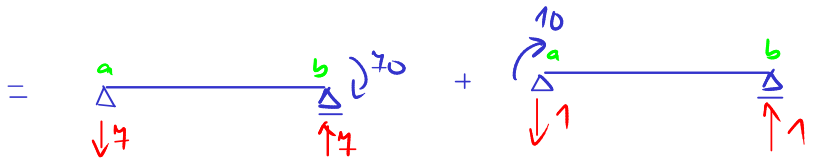
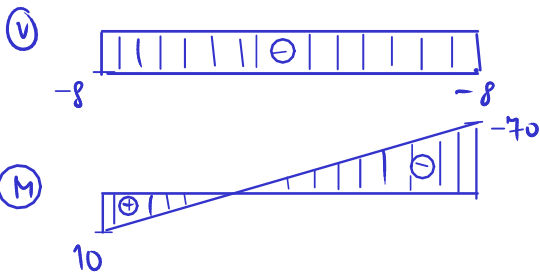
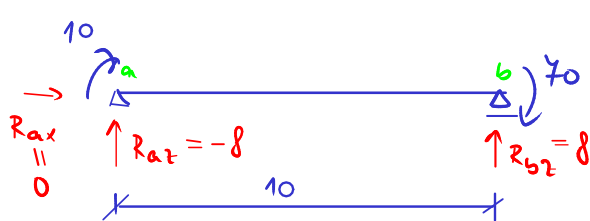
$$V_{ba} = V_{a-b}(x=10) = 20 - 4 \cdot 10 = -20 \text{ kN}$$

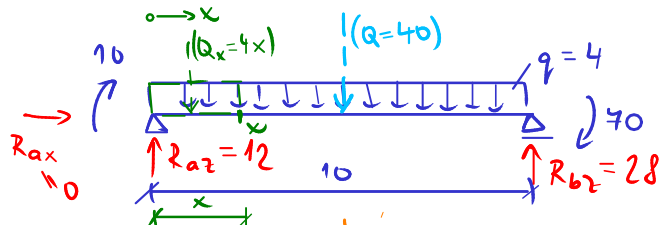
$$M_{a-b}(x) = R_{az} \cdot x - Q_x \cdot \frac{x}{2} = 20x - 2x^2$$

$$M_a = M_{a-b}(x=0) = 0$$

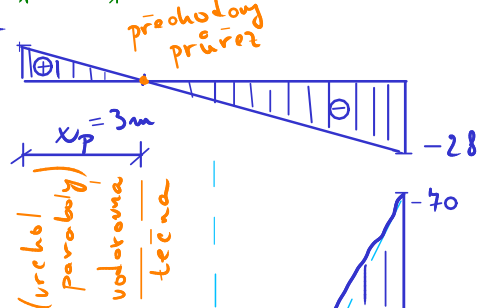
$$M_b = M_{a-b}(x=10) = 20 \cdot 10 - 2 \cdot 10^2 = 0$$

$$M_c = M_{a-b}(x=5) = 20 \cdot 5 - 2 \cdot 5^2 = 50 \text{ kNm}$$

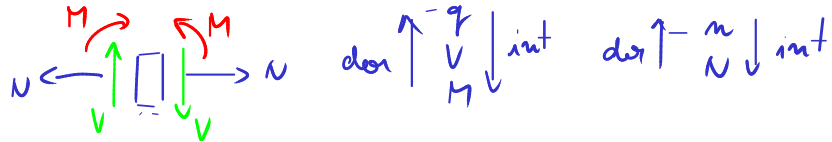
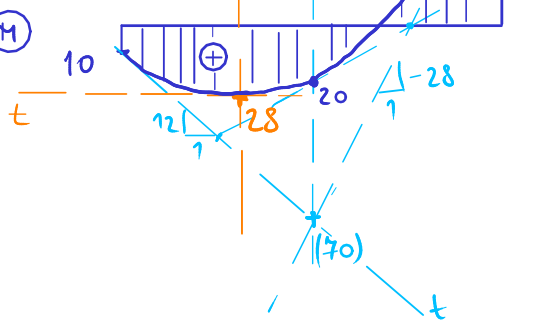




(V)

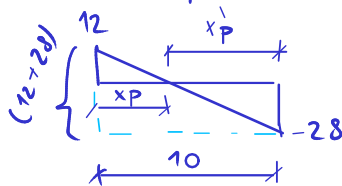


(M)



$$V_{a-b}(x) = R_{ax} - Q_x = 12 - 4x$$

$$V_{xp} = 0 \Rightarrow 12 - 4x = 0 \Rightarrow x = 3 \text{ m}$$



$$\frac{12}{x_p} = \frac{(12+28)}{10}$$

$$x_p = \frac{12 \cdot 10}{12+28} = 3 \text{ m}$$

$$x_p = \frac{V_{ab}}{q} = \frac{12}{4} = 3 \text{ m}$$

$$x'_p = \frac{V_{ba}}{q} = \frac{28}{4} = 7 \text{ m}$$

$$M_Q = (zleva) = 10 + R_{a2} \cdot 5 - (q \cdot 5) \cdot \frac{5}{2} = 20 \text{ kNm}$$

$$M_Q^{bez q} = (zleva) = 10 + R_{a2} \cdot 5 = 70 \text{ kNm}$$



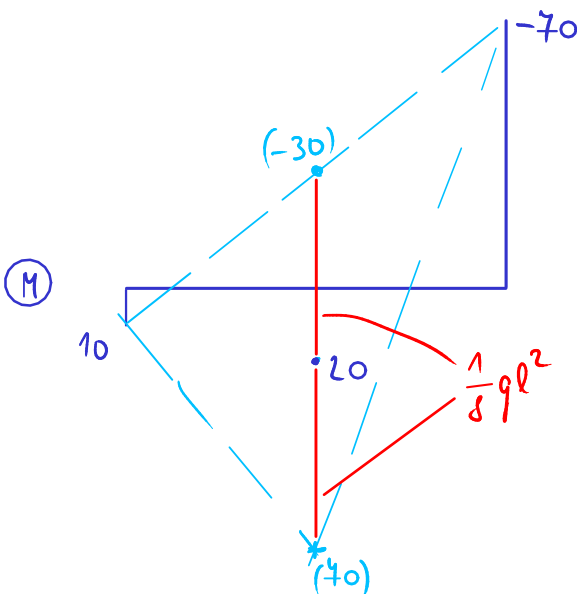
$$M_{xp}^L = 10 + R_{a2} \cdot x_p - (q \cdot x_p) \cdot \frac{x_p}{2} = 10 + 12 \cdot 3 - (4 \cdot 3) \cdot \frac{3}{2} = 28 \text{ kNm} = M_{max}$$

$$M_{a-b}(x) = 10 + R_{a2} \cdot x - (q \cdot x) \cdot \frac{x}{2} = 10 + 12x - 2x^2$$

$$M_{max}^L = M_a + \int_0^{x_p} V dx = 10 + \frac{1}{2} \cdot 12 \cdot 3 = 28 \text{ kNm}$$



$$M_{max}^P = M_b \ominus \int_{x_p}^l V dx = -70 - \frac{1}{2} \cdot 7 \cdot (-28) = 28 \text{ kNm}$$



vzepětí paraboly

$$\frac{1}{8} q l^2 = \frac{1}{8} \cdot 4 \cdot 10^2 = 50 \text{ kNm}$$

$$M_{max} = M\left(\frac{l}{2}\right) = \frac{Q}{2} \cdot \frac{l}{2} - \left(q \cdot \frac{l}{2}\right) \cdot \frac{l}{2} = \frac{ql^2}{4} - \frac{ql^2}{8} = \frac{1}{8} ql^2$$