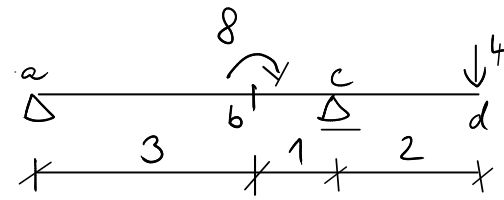


$$E = 306 \text{ Pa}$$

$$I_y = 514 \cdot 10^{-4} \text{ m}^4$$

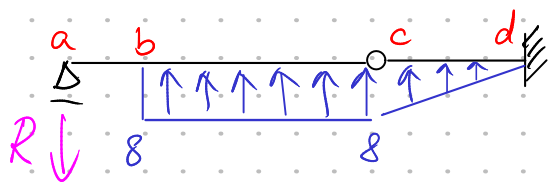
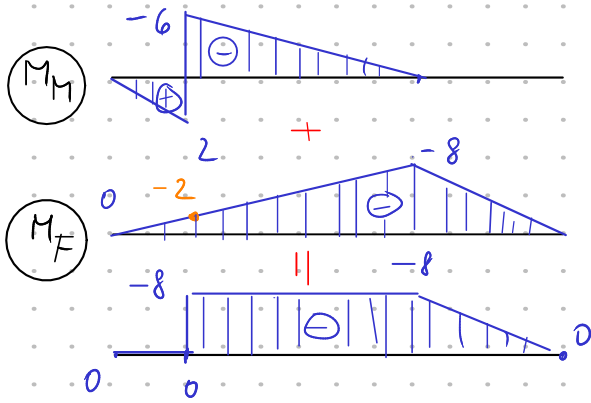
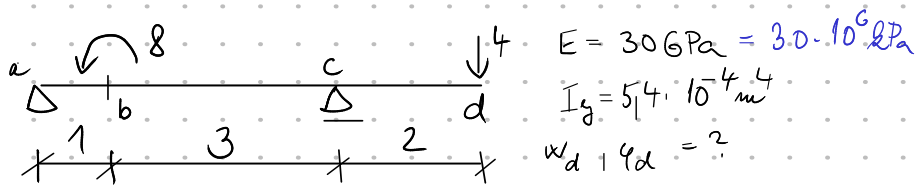
$$w_d, \varphi_d = ?$$



$$E = 306 \text{ Pa}$$

$$I_y = 514 \cdot 10^{-4} \text{ m}^4$$

$$w_b, \varphi_c = ?$$



$$\sum M_c = 0 \quad (+ \curvearrowright)$$

$$R \cdot 4 - 8 \cdot 3 \cdot \frac{3}{2} = 0$$

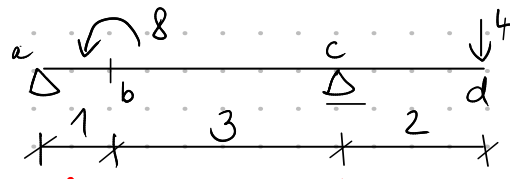
$$R = 9 \text{ kN}$$

$$\uparrow \tilde{V}_d = -R + 8 \cdot 3 + \frac{1}{2} \cdot 8 \cdot 2$$

$$\tilde{V}_d = 23 \text{ kN} \Rightarrow \varphi_d = \frac{23}{EI} = \frac{23}{30 \cdot 10^6 \cdot 514 \cdot 10^{-4}} = 1,419 \cdot 10^{-3} \text{ rad}$$

$$\uparrow \tilde{M}_d = -R \cdot 6 + 8 \cdot 3 \cdot (2 + 1,5) + \frac{1}{2} \cdot 8 \cdot \left(\frac{3}{2} \cdot 2\right)$$

$$\tilde{M}_d = 40,6 \text{ kNm} \Rightarrow w_d = \frac{40,6}{EI} = 2,570 \cdot 10^{-3} \text{ m}$$



$$\begin{aligned}
 M: & \uparrow \frac{8}{4} = 2 \\
 + & \downarrow \frac{4 \cdot 2}{4} = 2 \\
 R: & 0
 \end{aligned}$$

$$\uparrow M(x) = 0 \cdot x \Big|_{x>1} - 8 \Big|_{x>4} + 4 \cdot (x-4)$$

$$M(x=0) = 0 \checkmark$$

$$M(x=1) = 0 \checkmark$$

$$M(x=3) = -8 \checkmark$$

$$M(x=6) = 0 \checkmark$$

$$EI w'' = -M(x)$$

$$EI w'' = \begin{cases} 8 & |_{x>1} \\ -4(x-4) & |_{x>4} \end{cases}$$

$$EI w' = C_1 \Big|_{x>1} + 8(x-1) \Big|_{x>4} - 4 \frac{(x-4)^2}{2}$$

$$EI w = C_2 + C_1 x \Big|_{x>1} + 8 \frac{(x-1)^2}{2} \Big|_{x>4} - 2 \frac{(x-4)^3}{3}$$

$$w_a = w(x=0) = 0 \Rightarrow 0 = C_2 + C_1 \cdot 0 \Rightarrow C_2 = 0$$

$$w_c = w(x=4) = 0 \Rightarrow C_2 + C_1 \cdot 4 + 8 \cdot \frac{(4-1)^2}{2} = 0$$

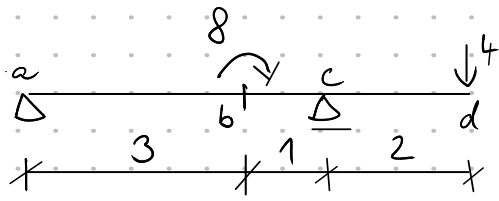
$$C_1 = -9$$

$$\varphi(x) = \frac{1}{EI} \left[-9 \Big|_{x>1} + 8(x-1) \Big|_{x>4} - 2(x-4)^2 \right]$$

$$w(x) = \frac{1}{EI} \left[-9x \Big|_{x>1} + 4(x-1)^2 \Big|_{x>4} - \frac{2}{3}(x-4)^3 \right]$$

$$\varphi_d = \varphi(x=6) = \frac{1}{EI} \left[-9 + 8(6-1) - 2(6-4)^2 \right] = \frac{23}{EI} \checkmark$$

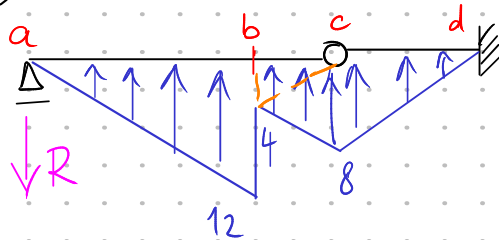
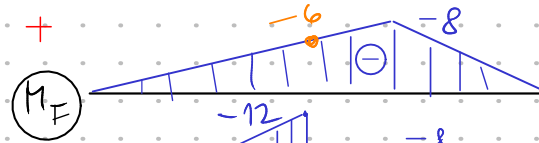
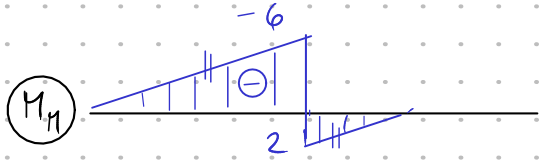
$$w_d = w(x=6) = \frac{1}{EI} \left[-9 \cdot 6 + 4(6-1)^2 - \frac{2}{3}(6-4)^3 \right] = \frac{40,6}{EI} \checkmark$$



$$E = 306 \text{ Pa}$$

$$I_y = 514 \cdot 10^{-4} \text{ m}^4$$

$$w_b, \varphi_c = ?$$



$$\sum M_c^L = 0 \quad (\oplus \uparrow)$$

$$R \cdot 4 - \frac{1}{2} \cdot 12 \cdot 3 \cdot \left(1 + \frac{1}{3} \cdot 3\right) - \frac{1}{2} \cdot 4 \cdot 1 \cdot \left(\frac{2}{3} \cdot 1\right) - \frac{1}{2} \cdot 8 \cdot 1 \cdot \left(\frac{1}{3} \cdot 1\right) = 0$$

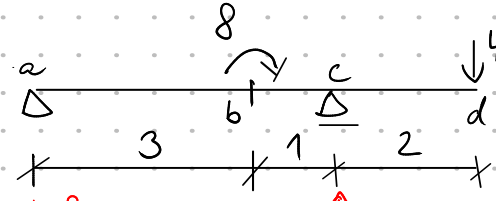
$$R = 9,6 \text{ kNm}^2$$

$$\uparrow \sum \tilde{V}_c = -R + \frac{1}{2} \cdot 12 \cdot 3 + \frac{1}{2} \cdot 4 \cdot 1 + \frac{1}{2} \cdot 8 \cdot 1 = 14,3 \text{ kNm}^2$$

$$\uparrow \sum \tilde{M}_b = -R \cdot 3 + \frac{1}{2} \cdot 12 \cdot 3 \cdot \left(\frac{1}{3} \cdot 3\right) = -11 \text{ kNm}^3$$

$$\varphi_c = \frac{\tilde{V}_c}{EI} = \frac{14,3}{30 \cdot 10^6 \cdot 514 \cdot 10^{-4}} = 0,885 \cdot 10^{-3} \text{ rad}$$

$$w_b = \frac{\tilde{M}_b}{EI} = \frac{-11}{30 \cdot 10^6 \cdot 514 \cdot 10^{-4}} = -0,679 \cdot 10^{-3} \text{ m}$$



$$M: \downarrow \frac{8}{4} = 2$$

$$F: \downarrow \frac{4 \cdot 2}{2} = 2$$

$$R: \downarrow 4$$

$$\uparrow 2$$

$$\uparrow \frac{4 \cdot 6}{4} = 6$$

$$\uparrow 8$$

$$w(x=0) = 0 \quad \checkmark$$

$$M(x=3<) = -12 \quad \checkmark$$

$$M(x=3>) = -4 \quad \checkmark$$

$$w(x=4) = -8 \quad \checkmark$$

$$\uparrow \sum M(x) = -4 \cdot x \Big|_{x>3} + 8 \Big|_{x>4} + 8(x-4)$$

$$EI w'' = -M(x)$$

$$EI w'' = 4x \Big|_{x>3} - 8 \Big|_{x>4} - 8(x-4)$$

$$EI w' = C_1 + 4 \frac{x^2}{2} \Big|_{x>3} - 8(x-3) \Big|_{x>4} - 8 \frac{(x-4)^2}{2}$$

$$EI w = C_2 + C_1 x + 2 \frac{x^3}{3} \Big|_{x>3} - 8 \frac{(x-3)^2}{2} \Big|_{x>4} - 4 \frac{(x-4)^3}{3}$$

$$w_a = w(x=0) = 0 \Rightarrow C_2 + C_1 \cdot 0 + 0 = 0 \Rightarrow C_2 = 0$$

$$w_c = w(x=4) = 0 \Rightarrow C_2 + C_1 \cdot 4 + \frac{2}{3} \cdot 4^3 - 4(4-3)^2 = 0 \Rightarrow C_1 = -9,6$$

$$\varphi(x) = \frac{1}{EI} \left[-9,6 + 2x^2 \Big|_{x>3} - 4(x-3) \Big|_{x>4} - 4(x-4)^2 \right]$$

$$w(x) = \frac{1}{EI} \left[-9,6 \cdot x + \frac{2}{3} x^3 \Big|_{x>3} - 4(x-3)^2 \Big|_{x>4} - \frac{4}{3} (x-4)^3 \right]$$

$$\varphi_c = \varphi(x=4) = \frac{1}{EI} \left[9,6 + 2 \cdot 4^2 - 8(4-3) \right] = \frac{14,3}{EI} \quad \checkmark$$

$$w_b = w(x=3) = \frac{1}{EI} \left[-9,6 \cdot 3 + \frac{2}{3} \cdot 3^3 \right] = \frac{-11}{EI} \quad \checkmark$$