

Clebsch
 $w(x=7) = ?$
 $\varphi(x=6) = ?$

$$M(x) = 1 \cdot x \Big|_{x>3} - 4(x-3) \Big|_{x>6} + 9 \cdot (x-6)$$

$$EI w'' = -x \Big|_{x>3} + 4(x-3) \Big|_{x>6} - 9(x-6)$$

$$EI w' = C_1 + \frac{x^2}{2} \Big|_{x>3} + 4 \frac{(x-3)^2}{2} \Big|_{x>6} - 9 \frac{(x-6)^2}{2}$$

$$EI w = C_2 + C_1 x - \frac{x^3}{6} \Big|_{x>3} + 2 \frac{(x-3)^3}{3} \Big|_{x>6} - 9 \frac{(x-6)^3}{6}$$

$$w(x=0) = 0 \Rightarrow C_2 = 0$$

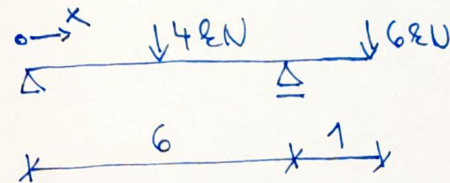
$$w(x=6) = 0 \quad 6C_1 - \frac{6^3}{6} + \frac{2}{3} 3^3 = 0 \Rightarrow C_1 = 3$$

$$w(x) = 3x - \frac{x^3}{6} \Big|_{x>3} + \frac{2(x-3)^3}{3} \Big|_{x>6} - \frac{3(x-6)^3}{2}$$

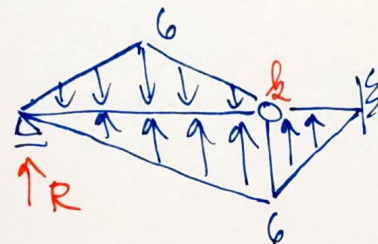
$$\varphi(x) = 3 - \frac{x^2}{2} \Big|_{x>3} + 2(x-3)^2 \Big|_{x>6} - 9 \frac{(x-6)^2}{2}$$

$$w(x=7) = \left[3 \cdot 7 - \frac{7^3}{6} + \frac{2 \cdot 4^3}{3} - \frac{3 \cdot 1^3}{2} \right] \cdot \frac{1}{EI} = \frac{5}{EI}$$

$$\varphi(x=6) = 3 - \frac{6^2}{2} + 2 \cdot 3^2 = \frac{3}{EI}$$



Mohr
 $w(x=7) = ?$
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$$\sum M_{xi} = 0 \quad \oplus \downarrow$$

$$R \cdot 6 + \frac{1}{2} 6 \cdot 6 \cdot \frac{1}{3} 6 - \frac{1}{2} 6 \cdot 6 \cdot \frac{1}{2} 6 = 0$$

$$\underline{R = 3}$$

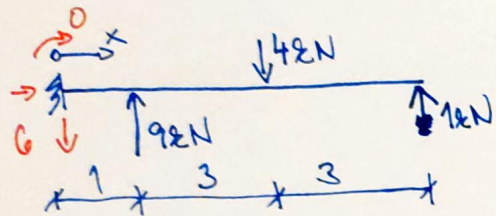
$$\tilde{M}(x=7) = 3 \cdot 7 + \frac{1}{2} \cdot 6 \cdot 6 \cdot \left(1 + \frac{1}{3} 6\right) + \frac{1}{2} 6 \cdot 1 \cdot \left(\frac{2}{3} 1\right) - \frac{1}{2} 6 \cdot 6 \cdot \left(\frac{1}{2} 6\right) = \underline{\underline{5}}$$

$$\tilde{U}(x=6) = 3 + \frac{1}{2} 6 \cdot 6 - \frac{1}{2} 6 \cdot 6 = \underline{\underline{3}}$$

$$I = 160,6 \cdot 10^6 \text{ mm}^4 \quad E = 2106 \text{ Pa}$$

$$w = \frac{5 \cdot 10^3}{210 \cdot 10^9 \cdot 160,6 \cdot 10^6} = 0,148 \cdot 10^{-3} \text{ m}$$

$$\varphi = \frac{3}{88,95 \cdot 10^{-6}} = 0,08895 \cdot 10^3 \text{ rad} = \underline{\underline{88,95 \cdot 10^{-6} \text{ rad}}}$$



Clebsch

$$w(x=7) = ?$$

$$\varphi(x=1) = ?$$

$$M(x) = -6 \cdot x \Big|_{x>0} + 9 \cdot (x-1) \Big|_{x>1} - 4 \cdot (x-4) \Big|_{x>4}$$

$$EI w'' = 6x \Big|_{x>0} - 9(x-1) \Big|_{x>1} + 4(x-4) \Big|_{x>4}$$

$$EI w' = 6 \frac{x^2}{2} \Big|_{x>0} - 9 \frac{(x-1)^2}{2} \Big|_{x>1} + 4 \frac{(x-4)^2}{2}$$

$$EI w = C_2 + C_1 x + 6 \frac{x^3}{3} \Big|_{x>0} - 9 \frac{(x-1)^3}{6} \Big|_{x>1} + 2 \cdot \frac{(x-4)^3}{3}$$

$$w(x=0) = 0 \Rightarrow C_2 = 0$$

$$w'(x=0) = 0 \Rightarrow C_1 = 0$$

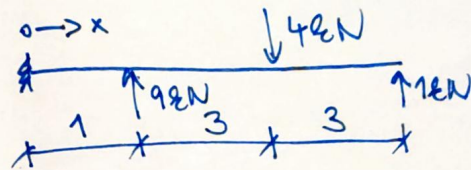
$$EI w(x) = x^3 \Big|_{x>0} - \frac{3}{2} (x-1)^3 \Big|_{x>1} + \frac{2}{3} (x-4)^3 \Big|_{x>4}$$

$$EI w'(x) = 3x^2 \Big|_{x>0} - \frac{9}{2} (x-1)^2 \Big|_{x>1} + 2(x-4)^2 \Big|_{x>4}$$

$$w(x) = 4^3 - \frac{3}{2} 6^3 + \frac{2}{3} 3^3 = 37$$

$$w'(x=6) = 3 \cdot 6^2 - \frac{9}{2} 5^2 + 2 \cdot 2^2 = 3,5$$

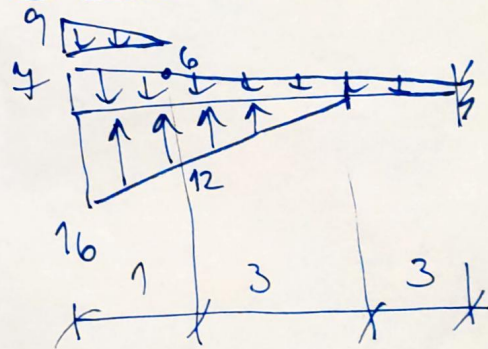
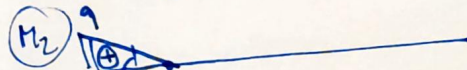
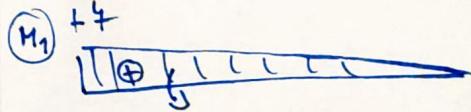
$$w(x=1) = 3 \cdot 1^2 = 3$$



Mohr

$$w(x=7) = ?$$

$$\varphi(x=1) = ?$$



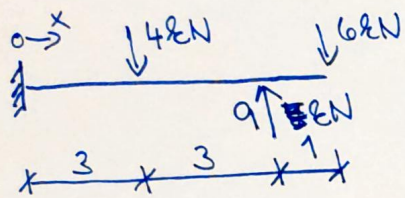
$$\begin{aligned} \tilde{U}(x=1) &= -\frac{1}{2} 9 \cdot 1 \\ &= -\frac{7+6}{2} \cdot 1 + \frac{16+12}{2} \cdot 1 = 3 \end{aligned}$$

$$\begin{aligned} \tilde{M}(x=7) &= -\frac{1}{2} 9 \cdot 1 \cdot \left(6 + \frac{2}{3} 1\right) - \frac{1}{2} 7 \cdot 7 \cdot \left(\frac{2}{3} 7\right) \\ &+ \frac{1}{2} 16 \cdot 4 \cdot \left(3 + \frac{2}{3} 4\right) = 37 \end{aligned}$$

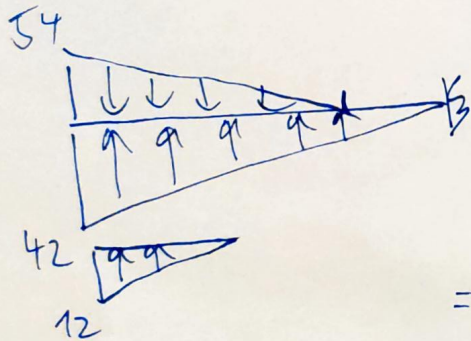
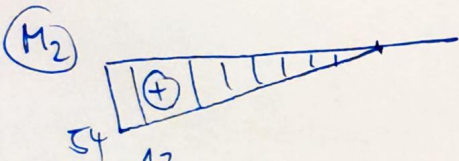
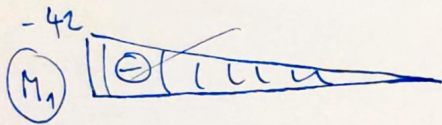
$$E = 210 \text{ GPa} \quad I = 4,93 \cdot 10^6 \text{ mm}^4$$

$$w = \frac{37 \cdot 10^{-3}}{210 \cdot 10^3 \cdot 4,93 \cdot 10^{-6}} = 0,035738 \text{ m} = 35,738 \text{ mm}$$

$$\varphi = \frac{3 \cdot 10^{-3}}{-11} = 2,898 \cdot 10^{-3} \text{ rad}$$

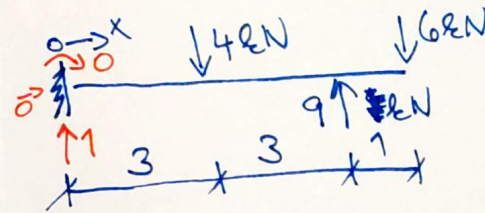


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$$\begin{aligned}\tilde{M}(x=7) &= \\ &= \frac{1}{2} \cdot 42 \cdot 7 \left(\frac{2}{3} \cdot 7\right) + \\ &= \frac{1}{2} \cdot 12 \cdot 3 \cdot \left(4 + \frac{2}{3} \cdot 3\right) - \\ &= -\frac{1}{2} \cdot 54 \cdot 6 \cdot \left(1 + \frac{2}{3} \cdot 6\right) = \\ &= -16\end{aligned}$$

$$\begin{aligned}\tilde{V}(x=6) &= \frac{1}{2} \cdot 12 \cdot 3 - \frac{1}{2} \cdot 54 \cdot 6 \cdot \frac{(4+6)}{2} \cdot 6 = 0 \\ I &= 80,3 \cdot 10^6 \text{ mm}^4 \quad E = 210 \text{ GPa} \\ w &= -\frac{16}{EI} = -\frac{16 \cdot 10^3}{210 \cdot 10^9 \cdot 80,3 \cdot 10^{-6}} = -0,949 \cdot 10^{-3} \text{ m} \\ \varphi &= 0\end{aligned}$$



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$$w(x=0) = 0 \Rightarrow C_2 = 0$$

$$\varphi(x=0) = 0 \Rightarrow C_1 = 0$$

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

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

$$w(x=7) = -\frac{7^3}{6} + \frac{2}{3} 4^3 - \frac{3}{2} 1^3 = -16$$

$$w'(x) = -\frac{6^2}{2} + 2 \cdot 3^2 - \frac{9}{2} = 0$$