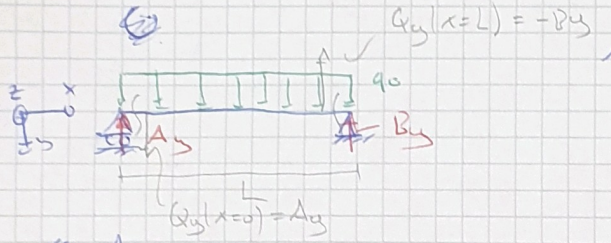
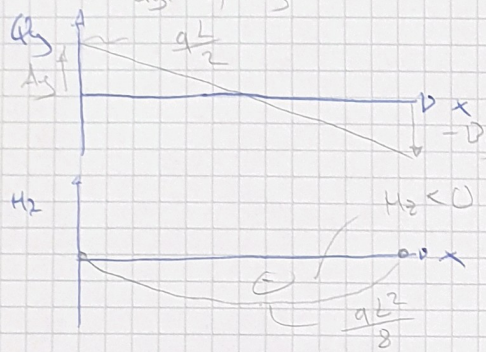
Serie 12 – S2

1.) LF0 (reales System) → $Q_0(x), M_0(x)$



$A_y = B_y = \frac{1}{2} q_0 L$ → wegen Symmetrie



$$Q_y = -\int q_y \, dx = -q_0 x + C_1$$

$$Q_y(x=0) = C_1 = qL/2$$

$$M_z = -\int Q_y \, dx = -\int -q_0 x + \frac{qL}{2} \, dx$$

$$= + \frac{q_0 x^2}{2} - \frac{qLx}{2} + C_2$$

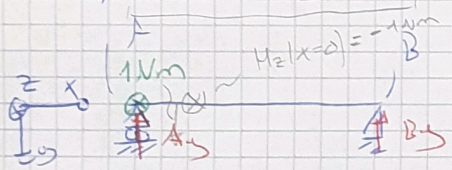
$$M_z(x=0) = 0 \rightarrow C_2 = 0$$

↳ $M_z(x=\frac{L}{2})$

$$= + \frac{q_0 L^2}{8} - \frac{q_0 L^2}{4}$$

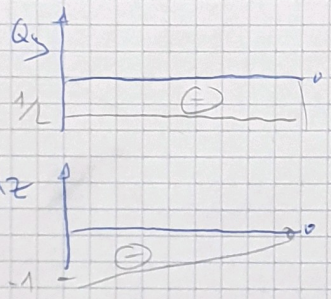
$$= - \frac{q_0 L^2}{8}$$

2.) LF1 (virtuelles System) → $Q_1(x), M_1(x)$



$$\sum M_z^{in A}: \quad 1 = B_y L \rightarrow B_y = 1/L$$

$$\sum F_y: \quad A_y = -B_y = -1/L$$



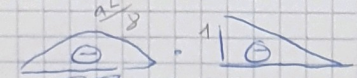
→ $Q_y(x=0) = A_y$

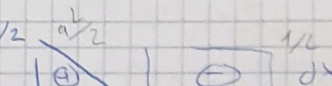
$$\rightarrow Q_y = -\int q_y \, dx = 0 + C_1 = C_1 = A_y$$

$$\rightarrow M_z = -\int Q_y \, dx = -A_y x + C_2$$

$$M_z(x=0) = -1\,Nm \rightarrow C_2 = -1\,Nm$$

3.) $$\theta = \int_L \frac{M_0 M_1}{EI} dx + \int_L \frac{Q_0 Q_1}{GA_s} dx$$

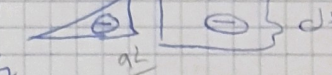
$$= \frac{1}{EI} \int_0^L$$ 

$dx + \frac{1}{GA_s} \int_0^{L/2}$ 

dx

$$= \frac{1}{EI_z} \frac{1}{3} \frac{qL^2}{8} \cdot (1) L$$

$$+ \frac{1}{GA_s} \frac{1}{2} \frac{qL}{2} \frac{1}{L} \frac{L}{2}$$

$$+ \frac{1}{GA_s} \int_{L/2}^{L}$$ 

dx

$$+ \frac{1}{GA_s} \frac{1}{2} \frac{qL}{2} \frac{1}{L} \frac{L}{2}$$

$$\rightarrow = \frac{1}{EI_z} \frac{1}{24} qL^3$$