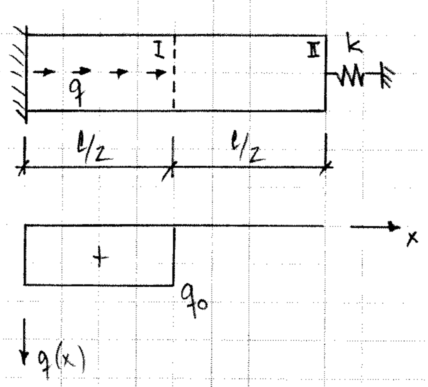
$EA = \text{konst.}, \quad k = \frac{EA}{l} \cdot \alpha \qquad \alpha = \begin{cases} 0 \\ 1 \\ \infty \end{cases}$



Gleichgewicht:

$$q = -\frac{dN}{dx}$$

kin. Relation:

$$\varepsilon = \frac{du}{dx}$$

Stoffgesetz:

$$N = EA \cdot \varepsilon$$

→ Differentialgleichung: $\quad q(x) = -\frac{dN(x)}{dx} = -EA \cdot \frac{d^2u}{dx^2}$

- Bereich I:

$$N_I(x) = -q_0 \cdot x + c_1$$

$$EA \cdot u_I(x) = -q_0 \frac{x^2}{2} + c_1 \cdot x + c_2$$

- Bereich II:

$$N_{II}(x) = N_0 = \text{konst.}$$

$$EA \cdot u_{II}(x) = N_0 \cdot x + c_3$$

- RB & ÜB

$$u_I(x=0) = 0 \quad \rightarrow \quad c_2 = 0$$

$$u_I(x = l/2) = u_{II}(x = l/2) \quad \rightarrow \quad -q_0 \frac{l^2}{8} + c_1 \cdot \frac{l}{2} - c_3 - N_0 \frac{l}{2} = 0$$

$$N_I(x = l/2) = N_{II}(x = l/2) \quad \rightarrow \quad -q_0 \frac{l}{2} + c_1 - N_0 = 0$$

$$N_{II}(x = l) = -k \cdot u_{II}(x = l) \quad \rightarrow \quad c_3 \cdot \frac{k}{EA} + N_0 \left(1 + \frac{kl}{EA}\right) = 0$$

- Lösung:

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ l/2 & 0 & -1 & -l/2 \\ 1 & 0 & 0 & -1 \\ 0 & 0 & \frac{k}{EA} & 1 + \frac{kl}{EA} \end{bmatrix}^{-1} \cdot \begin{bmatrix} 0 \\ q_0 \frac{l^2}{8} \\ q_0 \frac{l}{2} \\ 0 \end{bmatrix} = \begin{bmatrix} q_0 \frac{l}{8} \cdot \frac{4EA + 3lk}{EA + lk} \\ 0 \\ q_0 \frac{l^2}{8} \\ q_0 \frac{l^2}{8} \cdot \frac{k}{EA + lk} \end{bmatrix}$$

· Konstanten :

	$\alpha = 0$	$\alpha = 1$	$\alpha = \infty$	
C_1	$\frac{q_0 l}{2}$	$\frac{7 q_0 l}{16}$	$\frac{3 q_0 l}{8}$	
C_2	0	0	0	
C_3	$\frac{q_0 l^2}{8}$	$\frac{q_0 l^2}{8}$	$\frac{q_0 l^2}{8}$	
N_0	0	$-\frac{q_0 l}{16}$	$-\frac{q_0 l}{8}$	
x_{max}	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$	$\cdot\, l$
u_{max}	$\frac{1}{8}$	$\frac{49}{512}$	$\frac{9}{128}$	$\cdot\, \frac{q_0 l^2}{EA}$