

$$N_2 = -\frac{A}{l^2} x^2 + 1$$

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$$x=0 \quad y=0 \Rightarrow c=0$$

$$\left. \begin{aligned} x = -\frac{l}{2} \quad y = 0 &\Rightarrow a \frac{l^2}{4} - b \frac{l}{2} = 0 \\ x = \frac{l}{2} \quad y = 1 &\Rightarrow a \frac{l^2}{4} + b \frac{l}{2} = 1 \end{aligned} \right\} \begin{aligned} a &= \frac{2}{l^2} \\ b &= \frac{1}{l} \end{aligned}$$

$$N_3 = 2 \frac{x^2}{l^2} + \frac{x}{l}$$

The element stiffness matrix is given by:

$$[K_e] = \int_{-\frac{l}{2}}^{\frac{l}{2}} [B]^T [D] [B] A dx$$

where A is the cross-sectional area of the bar.