

Element 3: $\Pi(x) = EI [B]$

$$= EI [B] \begin{Bmatrix} v_3 \\ \psi_3 \\ v_4 \\ \psi_4 \end{Bmatrix} = EI [B] \begin{Bmatrix} \frac{19}{120} \frac{ql^4}{EI} + \frac{\pi l^2}{5EI} \\ \frac{1}{60} \frac{ql^3}{EI} + \frac{\pi l}{10EI} \\ 0 \\ -\frac{4}{15} \frac{ql^3}{EI} - \frac{3\pi l}{5EI} \end{Bmatrix}$$

$$= \left(-\frac{6}{l^2} + \frac{12x}{l^3}\right) \left(\frac{19}{120} ql^4 + \frac{\pi l^2}{5}\right) + \left(-\frac{4}{l} + \frac{6x}{l^2}\right) \left(\frac{1}{60} ql^3 + \frac{\pi l}{10}\right) + \left(-\frac{2}{l} + \frac{6x}{l^2}\right) \left(-\frac{4}{15} ql^3 - \frac{3\pi l}{5}\right)$$

$$= \left(-\frac{29}{60} + \frac{2}{5} \frac{x}{l}\right) ql^2 + \left(-\frac{2}{5} - \frac{3}{5} \frac{x}{l}\right) \pi$$

Bending moment diagrams

