Name_____ Student number_____

Assignment 3 (4p)

Principle of virtual work for a simply supported Bernoulli beam is given by the variational problem: find $w \in U$ such that

$$\delta W = \delta W^{\text{int}} + \delta W^{\text{ext}} = \int_{\Omega} (-\frac{d^2 \delta w}{dx^2} EI \frac{d^2 w}{dx^2} + \delta wb) dx = 0 \quad \forall \delta w \in U$$

in which $\Omega = (0, L)$, $\partial\Omega = \{0, L\}$, $U = \{w \in C^4(\Omega) : w = 0 \text{ on } x \in \{0, L\}\}$. Bending stiffness EI and the external distributed force b are constants. Deduce first the underlying boundary value problem. After that, solve the problem for the transverse displacement $w(x)$.

Answer $w(x) = \frac{1}{24} \frac{b}{EI} (x^4 - 2Lx^3 + L^3 x)$