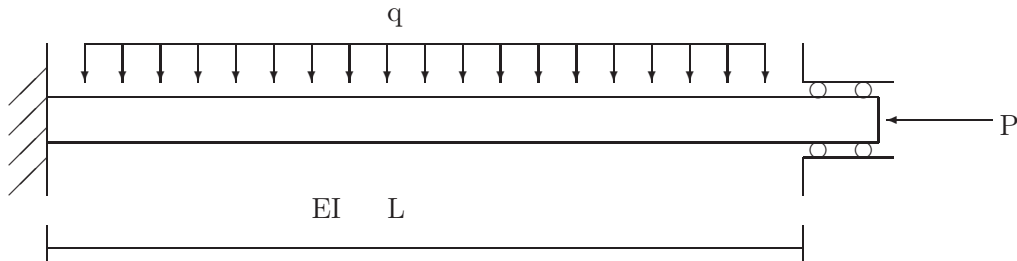# Stability of structures

Home exercises 5 and 6

Home exercise 5. Determine the maximum defcetion and maximum monents at supports and in span as a function of the compressive force P for the beam shown below.

Home exercise 6. Determine the critical buckling moment in the form $M_{\mathrm{cr}} = \lambda\sqrt{EI_y GI_t}/L$, where the parameter $\lambda = \lambda(k, h/L)$. Draw the critical load parameter λ as a function of k, when $k \in (-1, 1)$ and $L/h = 20, \nu = 0$. Use the principle of minimum potential energy or some other numerical method and use trigonometric trial functions.
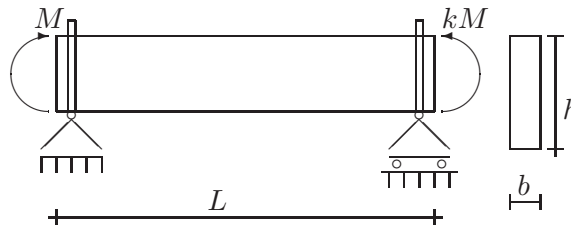
The expression for the total potential energy is

$$
\begin{aligned}
\Pi &= \frac{1}{2}\int_0^L \left[GI_t(\varphi')^2 + EI_y(w'')^2 + 2(M_z^0\varphi)'w'\right] dx \\
&= \frac{1}{2}\int_0^L \left[GI_t(\varphi')^2 + EI_y(w'')^2 + 2(M_z^{0'}\varphi + \varphi'M_z^0)w'\right] dx.
\end{aligned}
$$