LECTURE ASSIGNMENT 2

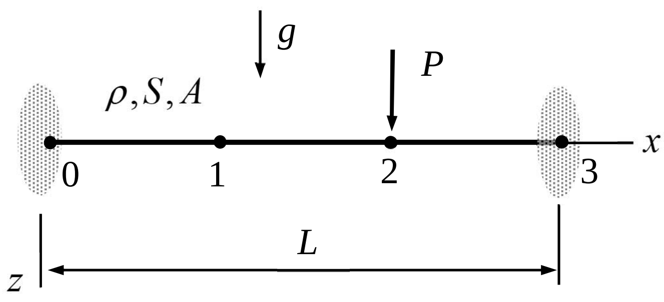
The equations for stationary string and bar problems given by the Finite Element Method on a regular spatial are

$$\frac{k}{\Delta x}(a_{i-1} - 2a_i + a_{i+1}) + F_i + f'\Delta x = 0 \quad i \in \{1, 2, \ldots, n-1\},$$

$$\frac{k}{\Delta x}(a_1 - a_0) + F_0 + f'\frac{\Delta x}{2} = 0 \quad \text{or} \quad a_0 = \underline{a}_0,$$

$$\frac{k}{\Delta x}(a_{n-1} - a_n) + F_n + f'\frac{\Delta x}{2} = 0 \quad \text{or} \quad a_n = \underline{a}_n.$$

Write the equations for the stationary string problem of grid points $i \in \{0,1,2,3\}$ shown in the figure. Tightening S, cross-sectional area A, and density of the material ρ are constants.



Name______________________________ Student number______________

At point $i = 0$, the displacement boundary condition applies

$$w_0 = 0$$ ←

At point $i = 1$, the equilibrium equation applies

$$3\frac{S}{L}(w_0 - 2w_1 + w_2) + \rho Ag\frac{L}{3} = 0$$ ←

At point $i = 2$, the equilibrium equation applies

$$3\frac{S}{L}(w_1 - 2w_2 + w_3) + P + \rho Ag\frac{L}{3} = 0$$ ←

At point $i = 3$, the displacement boundary condition applies

$$w_3 = 0$$ ←