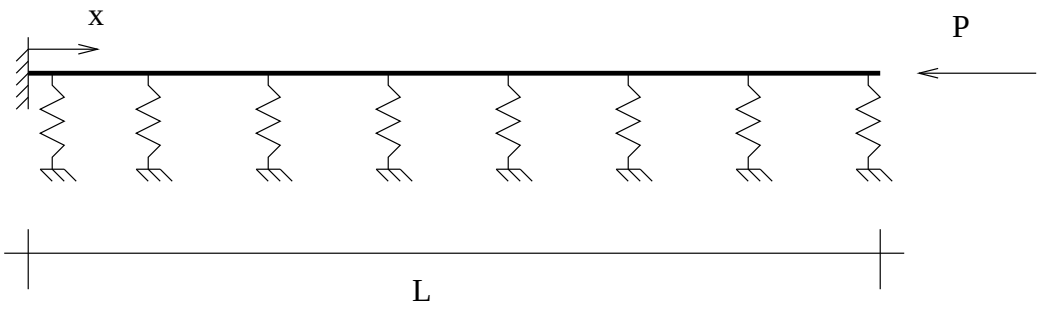
HW 8: Due FRIDAY April 16: 9:00am, 709 Davis Hall

1. (10pts) Consider a column with length $L = 1$ m and a 1×1 cm^2 square cross-section. The column has pin and pin-roller supports at $x = 0$ and $x = L$, respectively. Further, it is supported at its mid-span by a linear spring with spring constant $k = 0.5$ N/mm. The column is subjected to an axial compressive force P at the pin-roller support. Find the critical load using an approximate potential energy method with a single parameter. Assume $E = 200$ kN/mm^2.

2. (10pts) Consider the system in Problem 1 except that the axial compressive load is now applied at $x = 0.75$ m instead of at $x = 1$ m. Find the critical load using an approximate potential energy method with a single parameter.

3. (30pts) Consider a beam supported by a distributed spring foundation.[1] Assume the beam is 100 ft long with a Young's modulus of $E = 30 \times 10^6$ psi and a cross sectional area moment of inertia $I = 77.4$ in^4. Assume a foundation stiffness of $k = 100$ lb/in^2 and find the axial buckling load (with small deformation assumptions). To solve this problem you should write a program that implements the following general approximation $v(x) = \sum_{i=1}^{n} c_i f_i(x)$ where $f_i = (x/L)^{i+1}$.



[1] See also Homework Assignment 3.