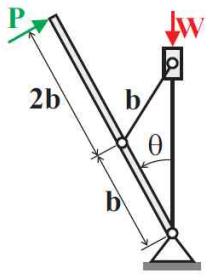
2014-2 항공기 구조역학 Homework #5

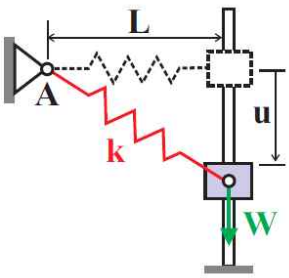
Problem 9.5. Lever mechanism

A bar of length $3b$ is pinned at its lower end and supports a normal load, P, applied at its tip, as shown in fig. 9.21. A second bar, of length b, is pinned to the first bar as shown and to a slider that is constrained to move vertically on a frictionless rod. A weight, W, is supported at the slider. Use the principle of virtual work to determine the force, P, required to keep the weight, W, in equilibrium as a function of angle θ.



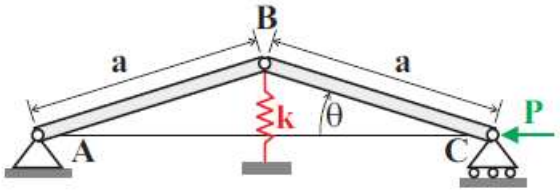
Problem 9.6. Spring-mass problem with nonlinear geometry

A spring of stiffness constant, k, and un-stretched length, L, is fastened to a support at point **A** and is connected to a weight, W, as shown in fig. 9.22. The weight slides on a frictionless vertical rod and the spring is un-stretched when horizontal. Determine the equilibrium configuration of the system, *i.e.*, position, u, of the weight.



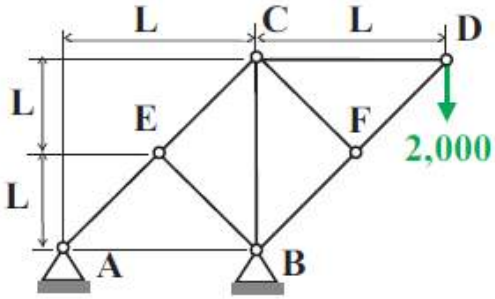
Problem 9.11. Axially loaded pinned bars with lateral spring restraint

Two rigid bars, **AB** and **BC**, are pinned together at point **B**, as shown in fig. 9.26. The end of the first bar is pinned to the ground at point **A**, whereas the end of the other bar is constrained to slide horizontally at point **C** under the action of load P. A lateral spring of stiffness constant k is attached at point **B**. Angle θ between bar **BC** and the horizontal is the generalized coordinate used to define the system's configuration. Use the principle of virtual work to develop an expression for $P = P(\theta)$. From your analysis, identify the buckling load of the problem.



Problem 9.17. Deflection of a planar truss

Determine the vertical deflection of joint **D** in the planar truss shown in fig. 9.47. The truss is supported at point **A** and **B**, but no bar joins these two points. All bar are of cross-sectional area, $\mathcal{A}$, and modulus, E.



Problem 9.24. Pivoted beam supported by three-bar truss

A root pivoted beam carries a concentrated mid-span load, P, and is supported by a three-bar truss, as shown in fig. 9.61. *(1)* Combine the unit load method for beams and trusses to determine the midpoint deflection for the beam. *(2)* Determine the vertical deflection of point **A**.