Problem 1: Calculate the tip deflection using equivalence of work and energy. Plot the variation of the deflection as a function of the spring constant $k$. For simplicity, normalize the deflection in your plot by the deflection when $k = 0$.

Problem 2: Calculate the strain energy in the beam shown below. Neglect possible stress concentration effects at the change in cross section.

Problem 3: Calculate the strain energy in the bar shown below in which the cross section varies linearly from $A_1$ to $A_2$. Comment on the result as $A_2$ approaches zero. Compute the elongation of the bar using equivalence of work and energy. Is the deflection inversely proportional to the average cross sectional area? Comment?
Problem 4: Consider a 10 ft long steel wire with cross sectional area 0.1 sq. in. weight density of 500 lb/cubic foot and E = 30,000 ksi. A 300 lb weight is hung from the end of the wire.

(a) What is the strain energy in the wire due to the 300lb weight neglecting selfweight?
(b) Due to selfweight, neglecting the applied load?
(c) Due to combined selfweight and applied force?
(d) Comment on the prior results. Are energies additive in this case?
(d) At what velocity would a soccer ball have to travel to have kinetic energy equivalent to the total strain energy in the wire?