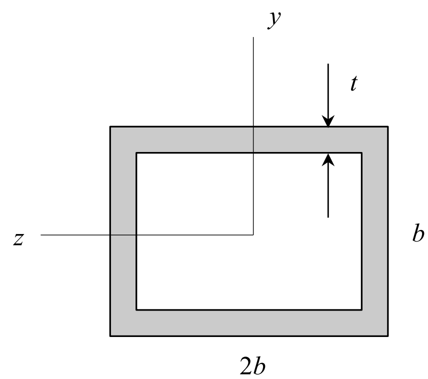
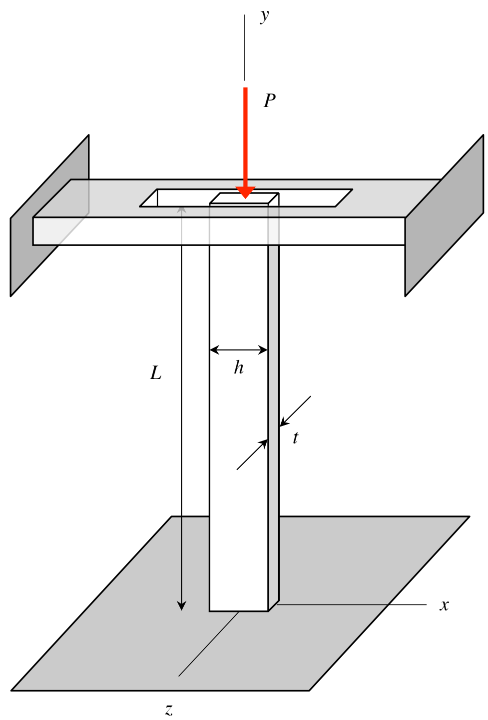
Example 18.3

A tubular steel column, with the cross section shown below and a length of L, is subjected to an axial load of P. The material of the column has a Young's modulus of E and a yield strength of σ_Y. If the column has fixed-free end conditions, what is the factor of safety for buckling?



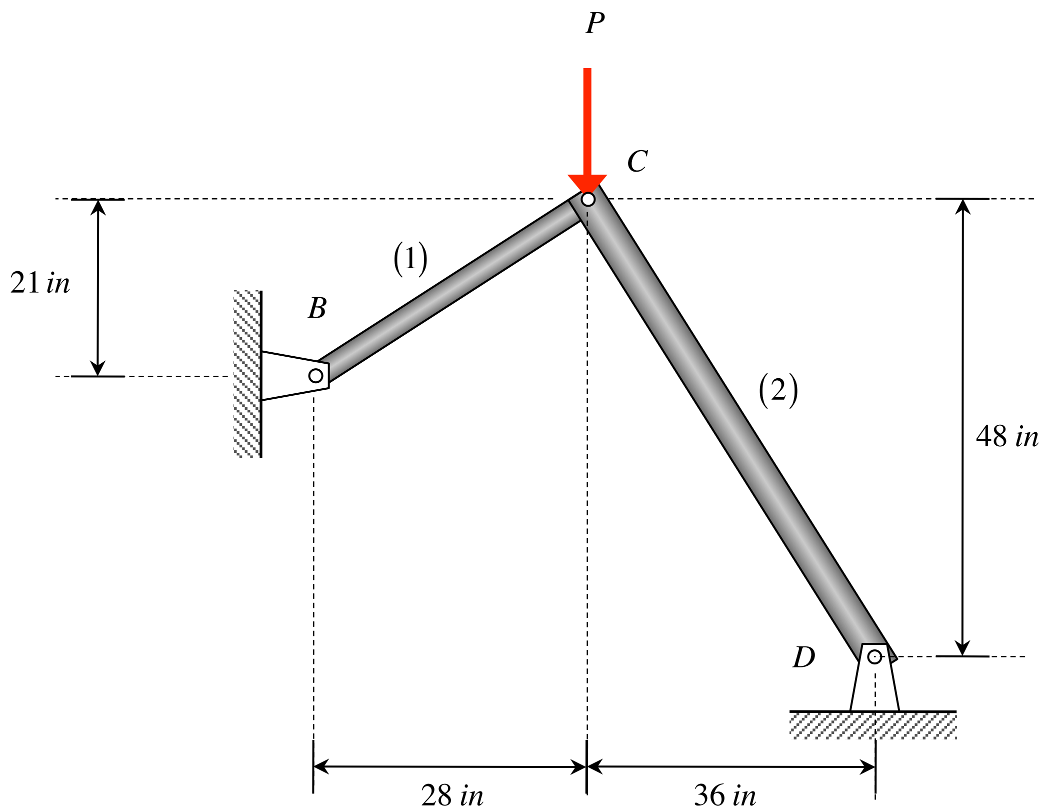
Example 18.5

The column shown below is clamped onto to ground at its bottom, with the top of the beam able to slide within a slot. The column carries an axial load of P. What is the largest load P that the column can withstand without buckling? Use $h = 3t$ and $L = 10h$.



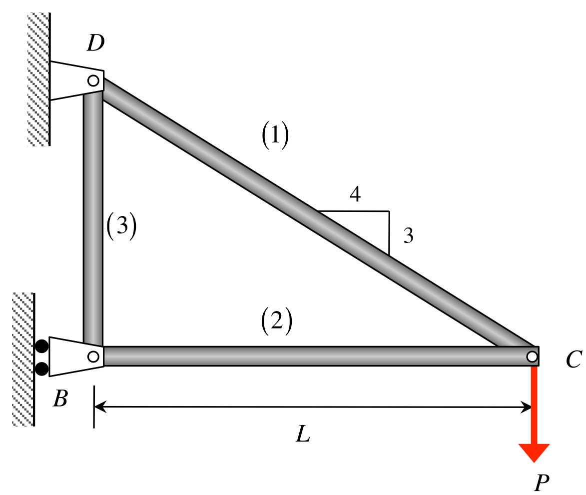
Example 18.7

The truss shown is made up of members (1) and (2), each made up of a material having a Young's modulus of $E = 30 \times 10^6\ psi$ and have a solid circular cross section. The diameters of members (1) and (2) are 0.5 in and1.0 in, respectively. Determine the largest load *P* that can be applied at joint C without buckling occurring in the structure. Consider only in-plane Euler buckling in your analysis.



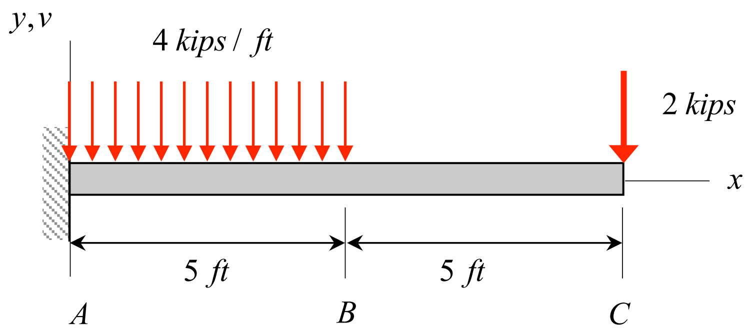
Example 18.8

The truss shown is constructed from members (1), (2) and (3), with each member made up of a material having a Young's modulus of $E = 10\times10^6\ psi$, a yield strength of $\sigma_Y = 60\times10^3\ psi$ and each member having a solid circular cross section with a diameter of $d = 1\ in$. A force $P = 10\ kips$ is applied to joint C in the truss. Determine the maximum length L allowed to prevent buckling in the truss. State whether the Euler theory or the Johnson theory was used in arriving at your result. Provide a justification for the choice of buckling theory used here.



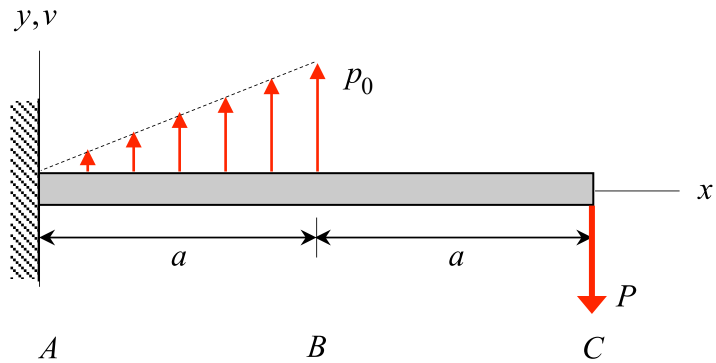
Example 19.3

Shown below is a cantilevered $W14 \times 120$ wide flange beam made up of steel, with $E = 29 \times 10^3\, ksi$. As shown in the Appendix of the textbook, this beam has a cross-sectional area of $A = 35.3\, in^2$ and a second area moment of $I = 1380\, in^4$. Determine the slope and deflection at end C of the beam due to the loading shown.



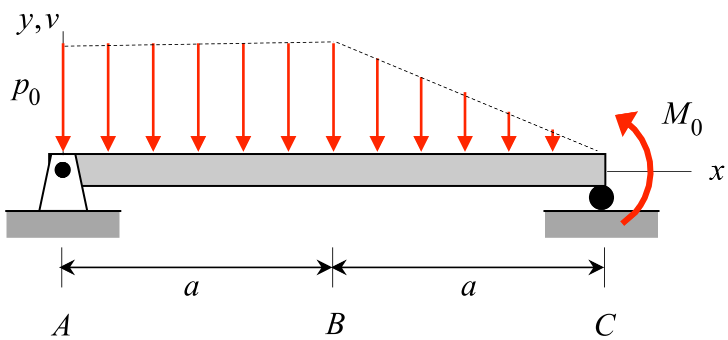
Example 19.6

Determine the deflection curve v(x) for the beam shown below.



Example 19.7

Determine the deflection curve $v(x)$ for the beam shown below.



Example 19.8

Determine the deflection curve $v(x)$ for the beam shown below.