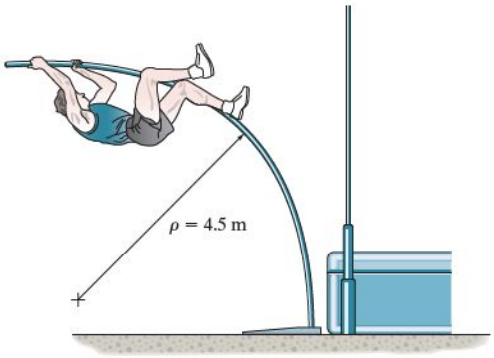
PROBLEMS

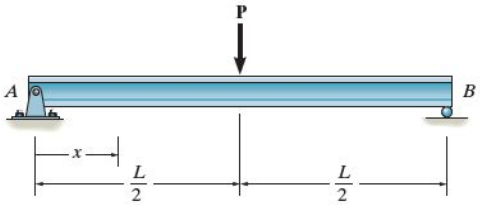
12–1. An L2 steel strap having a thickness of 0.125 in. and a width of 2 in. is bent into a circular arc of radius 600 in. Determine the maximum bending stress in the strap.

12–2. A picture is taken of a man performing a pole vault, and the minimum radius of curvature of the pole is estimated by measurement to be 4.5 m. If the pole is 40 mm in diameter and it is made of a glass-reinforced plastic for which $E_g = 131$ GPa, determine the maximum bending stress in the pole.



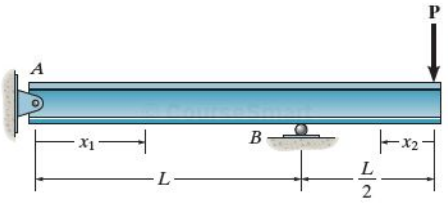
Prob. 12–2

12–3. Determine the equation of the elastic curve for the beam using the x coordinate that is valid for $0 \le x < L/2$. Specify the slope at A and the beam's maximum deflection. EI is constant.



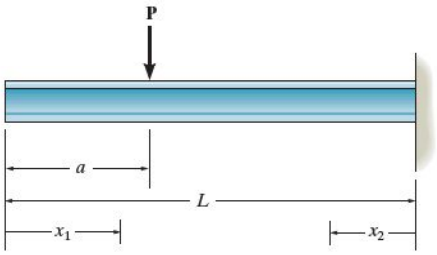
Prob. 12–3

***12–4.** Determine the equations of the elastic curve for the beam using the x_1 and x_2 coordinates. Specify the beam's maximum deflection. EI is constant.



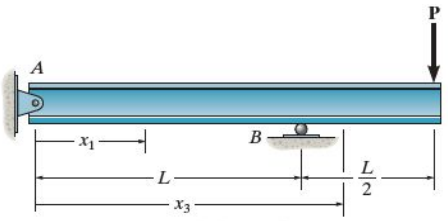
Prob. 12–4

12–5. Determine the equations of the elastic curve using the x_1 and x_2 coordinates. EI is constant.



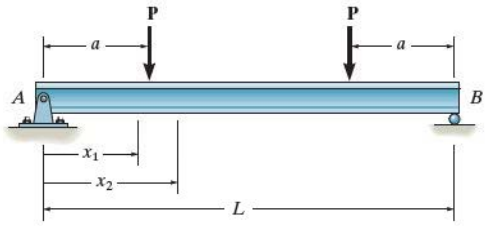
Prob. 12–5

12–6. Determine the equations of the elastic curve for the beam using the x_1 and x_3 coordinates. Specify the beam's maximum deflection. EI is constant.



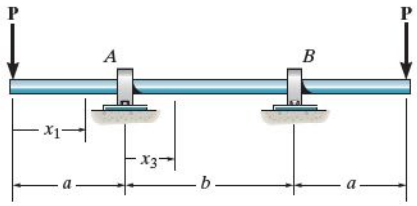
Prob. 12–6

12–7. Determine the equations of the elastic curve for the shaft using the x_1 and x_2 coordinates. Specify the slope at A and the displacement at the center of the shaft. EI is constant.



Prob. 12–7

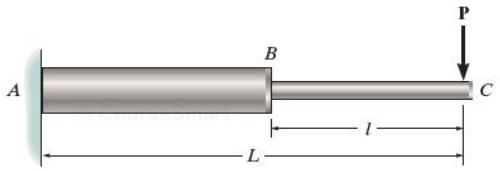
*12–8. Determine the equations of the elastic curve for the shaft using the x_1 and x_3 coordinates. Specify the slope at A and the deflection at the center of the shaft. EI is constant.



Prob. 12–8

12–9. The beam is made of two rods and is subjected to the concentrated load **P**. Determine the maximum deflection of the beam if the moments of inertia of the rods are I_{AB} and I_{BC}, and the modulus of elasticity is E.

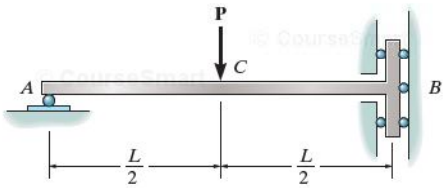
12–10. The beam is made of two rods and is subjected to the concentrated load **P**. Determine the slope at C. The moments of inertia of the rods are I_{AB} and I_{BC}, and the modulus of elasticity is E.



Probs. 12–9/10

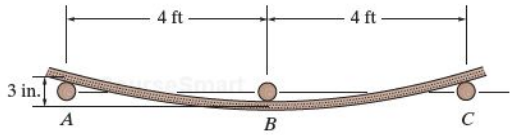
12–11. The bar is supported by a roller constraint at B, which allows vertical displacement but resists axial load and moment. If the bar is subjected to the loading shown, determine the slope at A and the deflection at C. EI is constant.

*12–12. Determine the deflection at B of the bar in Prob. 12–11.



Probs. 12–11/12

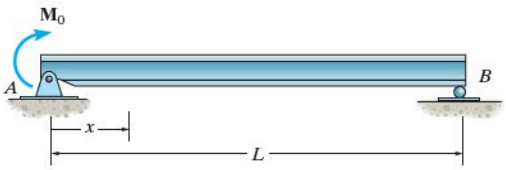
12–13. The fence board weaves between the three smooth fixed posts. If the posts remain along the same line, determine the maximum bending stress in the board. The board has a width of 6 in. and a thickness of 0.5 in. $E = 1.60(10^3)$ ksi. Assume the displacement of each end of the board relative to its center is 3 in.



Prob. 12–13

12–14. Determine the equation of the elastic curve for the beam using the x coordinate. Specify the slope at A and the maximum deflection. EI is constant.

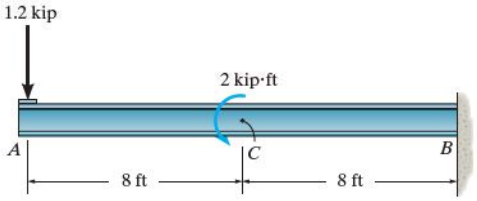
12–15. Determine the deflection at the center of the beam and the slope at B. EI is constant.



Probs. 12–14/15

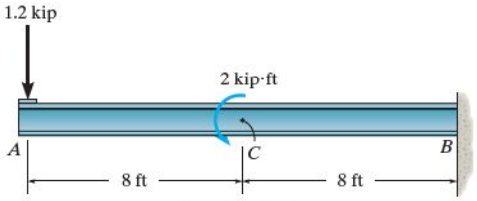
PROBLEMS

12–89. The W8 × 48 cantilevered beam is made of A-36 steel and is subjected to the loading shown. Determine the displacement at its end A.



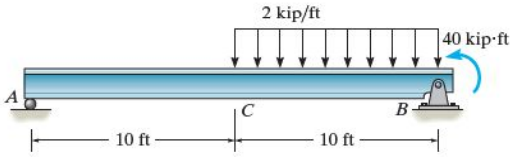
Prob. 12–89

12–90. The W8 × 48 cantilevered beam is made of A-36 steel and is subjected to the loading shown. Determine the displacement at C and the slope at A.



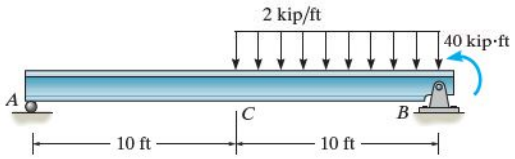
Prob. 12–90

12–91. The W14 × 43 simply supported beam is made of A-36 steel and is subjected to the loading shown. Determine the deflection at its center C.



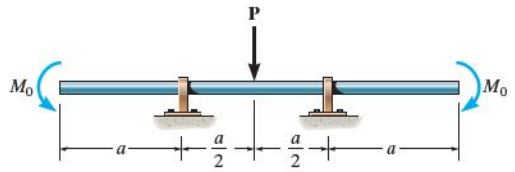
Prob. 12–91

***12–92.** The W14 × 43 simply supported beam is made of A-36 steel and is subjected to the loading shown. Determine the slope at A and B.



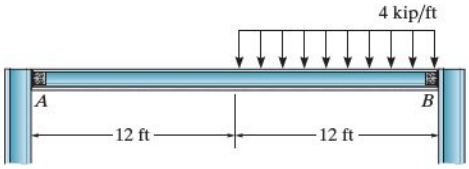
Prob. 12–92

12–93. Determine the moment M_0 in terms of the load P and dimension a so that the deflection at the center of the beam is zero. EI is constant.



Prob. 12–93

12–94. The beam supports the loading shown. Code restrictions, due to a plaster ceiling, require the maximum deflection not to exceed 1/360 of the span length. Select the lightest-weight A-36 steel wide-flange beam from Appendix B that will satisfy this requirement and safely support the load. The allowable bending stress is $\sigma_{allow} = 24$ ksi and the allowable shear stress is $\tau_{allow} = 14$ ksi. Assume A is a roller and B is a pin.



Prob. 12–94