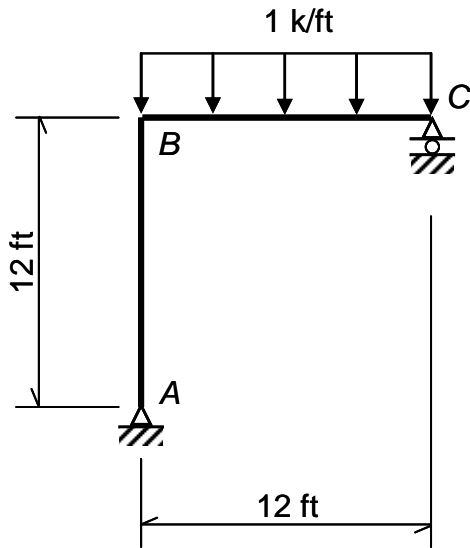
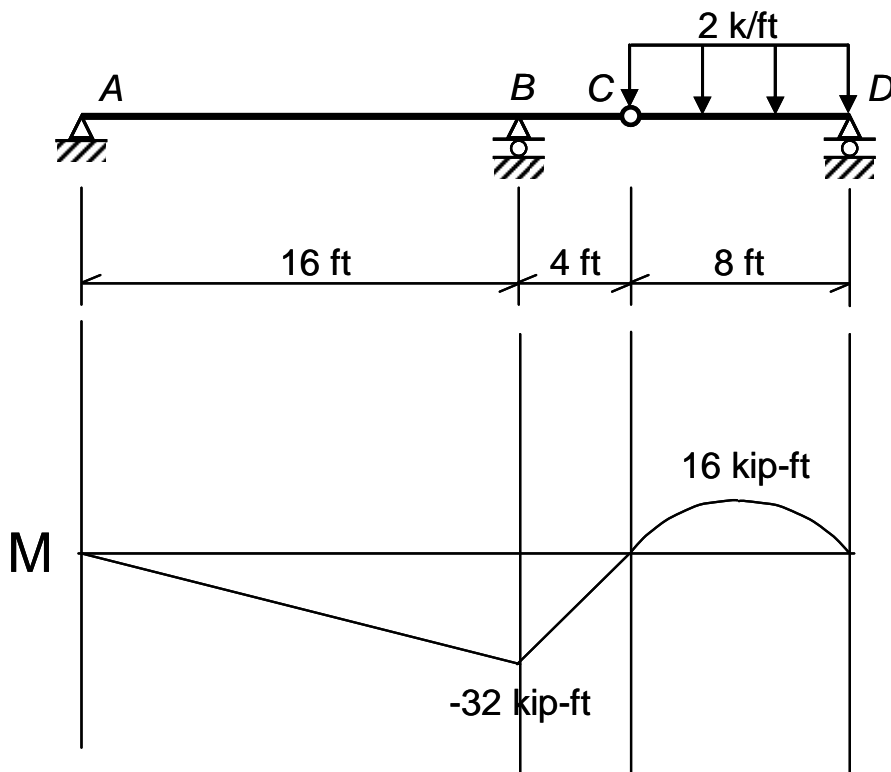


PRACTICE QUESTIONS – SET #2

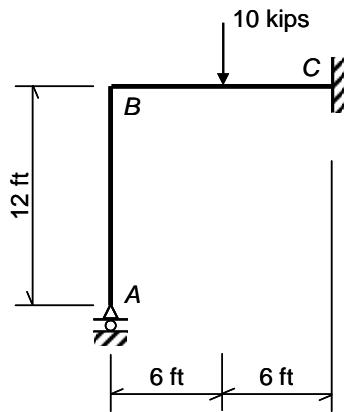
- Does the frame shown below experience sidesway under the given loading? If it does, find the amount of the sway using moment-area method? Sketch the deflected shape. EI is constant. A is pinned-support; C is a roller-support. Joint B is rigid.



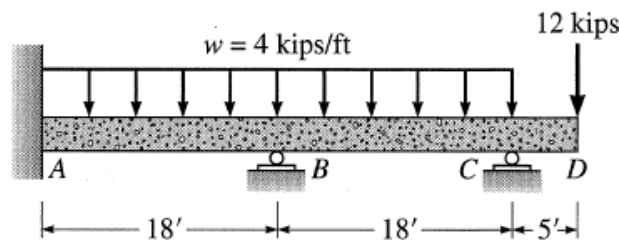
- Using the conjugate-beam method, determine the rotation at B and the deflection at C . Note that the moment diagram for the original structure is given. EI is constant.



3. Use the method of consistent deformations (also known as the flexibility method) to determine the reactions for the structure shown below. Let the moment at C be the redundant. EI is constant. A is a roller-support; C is a fixed-support. Joint B is rigid.

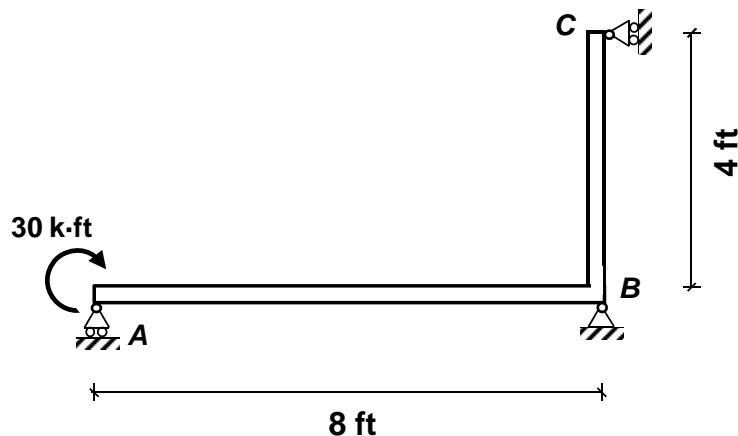


4. Use slope-deflection method, analyze the beam shown below. Draw the bending-moment diagram. Sketch the deflected shape. EI is constant.



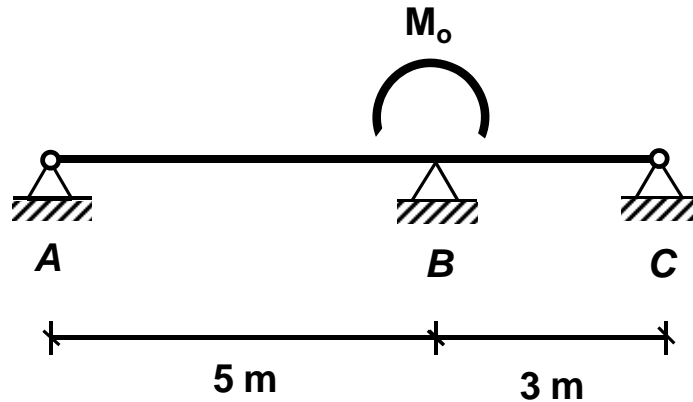
5. A continuous bent-frame ABC is supported by roller-supports at A and C , and a pinned-support at B . The roller-support at A prevents the beam from displacing vertically at A ; the roller-support at C prevents the beam from displacing horizontally at C . As shown below, a 30 k-ft external moment is applied on the beam at A . Consider flexural response only and assume that EI is constant throughout the bent-frame.

- What is the degree of statical indeterminacy?
- Find the reactions at the supports.
- Draw the bending moment diagram for the bent-frame.
- Sketch the deflected shape.



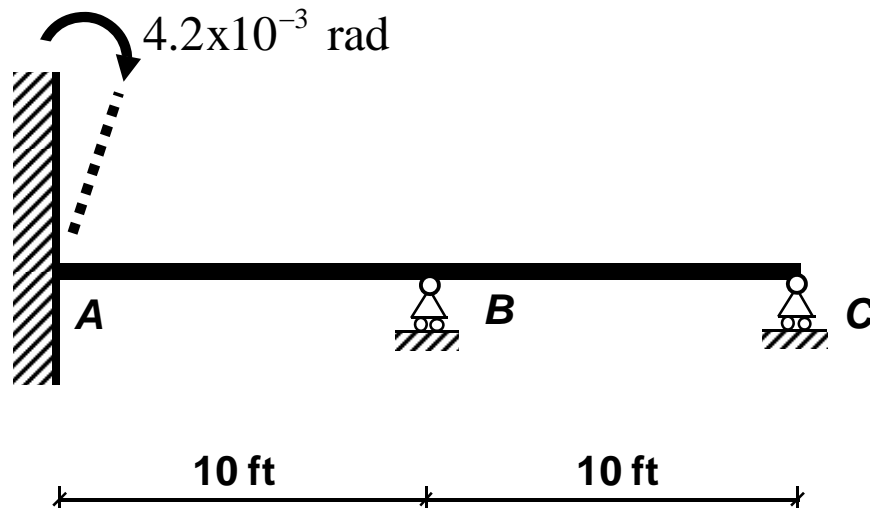
6. An 8-m long continuous prismatic steel beam, i.e. with constant EI , is supported on three pinned supports as shown below. Rotations at A , B , and C are the chosen degrees of freedom. An external moment of magnitude M_o is applied on the beam at B . Under the given loading, the beam rotates by $20/EI$ radians counter-clockwise at A ; $40/EI$ radians clockwise at B ; and $20/EI$ radians counter-clockwise at C .

- Find the amplitude and sense (clockwise or counterclockwise?) of M_o .
- Draw the bending moment diagram. Do not forget to indicate your sign convention.
- Sketch the deflected shape.



7. The beam ABC is made out of a single prismatic element with $EI=30 \times 10^6$ kip-in². The beam has an internal roller support at B and a roller support at C . At support A , it is connected rigidly to a wall which was initially vertical. However, due to a foundation problem the wall has rotated by 4.2×10^{-3} radians in clockwise direction which causes the beam to rotate as much at A . Analyze the beam using slope-deflection equations approach.

- Find the slope of the beam at B .
- Find the slope of the beam at C .
- Draw the bending moment diagram.
- Sketch the deflected shape.
- Draw the shear force diagram.
- Find the reactions at A , B , and C .



8. The bent frame ABC has constant EI throughout. It has pinned supports at A and C , and a rigid joint at B . The frame is loaded at mid-height between A and B with a concentrated load of 9 kip acting towards right. Analyze the structure using slope-deflection method.

- a. Find the amount of rotation at B .

