Model Problem 10-38

There were several changes made to this problem before solving and modeling.

All the beams AC, CD, and BC were removed to make the problem a single beam. The left end of the beam at point A was fixed and point B was also fixed. The length of the beam and force P were not changed. The problem statement became the following: Determine the reactions and then draw the bending moment diagram. Assume EI is constant.

The problem was solved in the hand calculations using techniques from earlier in the chapter.

The figure below shows the beam, the applied forces, and the bending moment diagram.

The following table shows the reaction forces. They match the ones in the hand calculations.
Hand Calculations – Note that the program inverts the direction of the axis therefore the bending moment diagram is a mirror image.

Revised Model Problem 10-38

\[ M_a = \frac{P L^3}{144 EI} + \frac{M_a L}{6EI} + \frac{M_b L}{GEI} = 0 \]

\[ B_a = -\frac{M_b L}{2EI} - \frac{M_a L}{EI} + \frac{P L}{16EI} = 0 \]

\[ M_a = M_b \left( \frac{1}{3} + \frac{1}{6} \right) \]

\[ M_a = \frac{PL^3}{144EI} \]

\[ M_a = \frac{1}{2} \frac{PL}{16} = \frac{PL}{32} = M_b \]

\[ M_a = M_b = 120 \text{k-ft} \]

\[ A_x = 20 \]

\[ A_y = B_y = P \]

\[ A_y = B_y = \frac{P}{2} = 20 \text{k} \]

\[ V \]

\[ M \]

120 k-ft