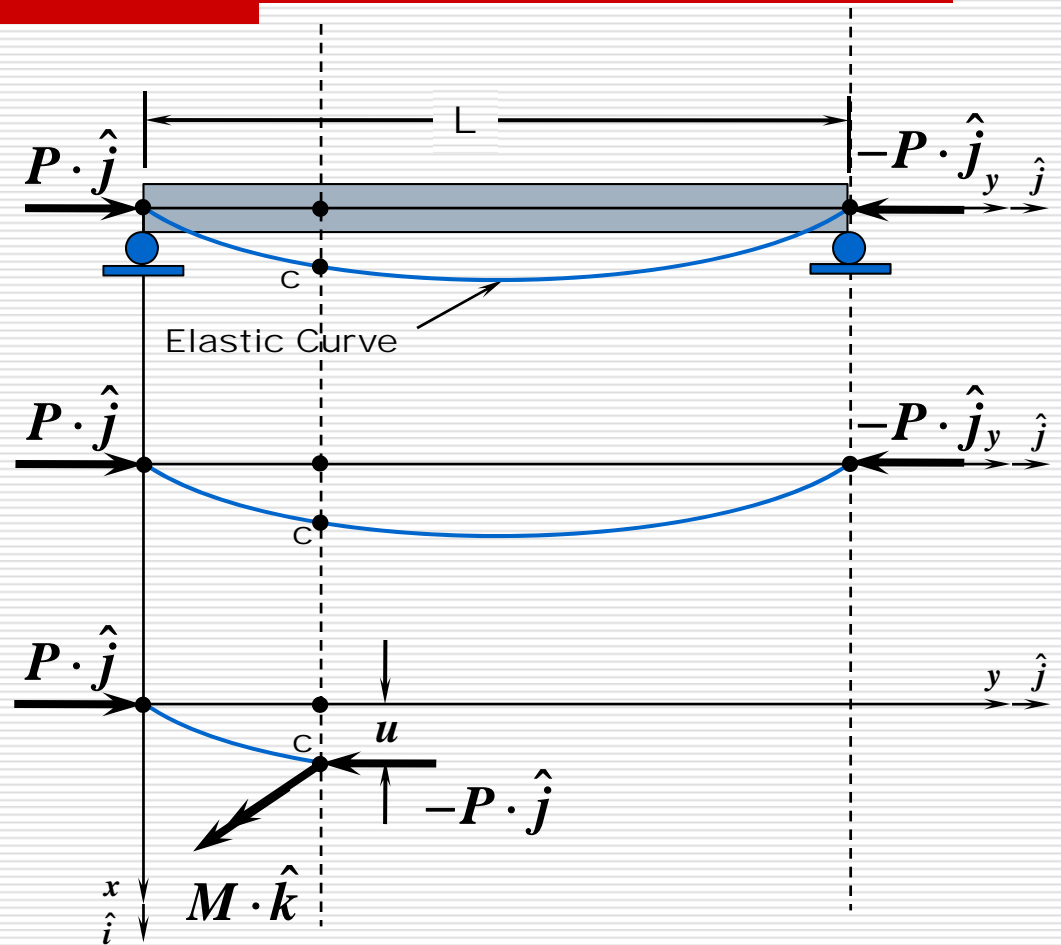


HOMEWORK PROBLEM: Following the procedure used during the class lecture, set up and solve the differential equation to find an expression for P_{CR} for the case of a with Pin-Pin constraints.

$$P_{cr} = \frac{\pi^2}{L^2} \cdot E \cdot I$$



[illegible]

The figure consists of three vertically stacked diagrams illustrating the deformation of a beam under a central point load P . The beam has a total length L , with supports at $x=0$ and $x=L$. The distance from each support to the center is $L/2$, and the distance from each support to the quarter-point is $L/4$. The coordinate system has \hat{i} pointing down and \hat{j} pointing right.

- Top Diagram:** Shows the undeformed beam. A central point load $P \cdot \hat{j}$ is applied at $x=L/2$. The beam is supported at $x=0$ and $x=L$ by vertical reactions $-P \cdot \hat{j}_y$.
- Middle Diagram:** Shows the deformed beam with the elastic curve. The central load is $P \cdot \hat{j}$ and the reactions are $-P \cdot \hat{j}_y$. The beam is also subjected to a central point moment $M_o \cdot \hat{k}$ at $x=L/2$.
- Bottom Diagram:** Shows the beam with a central point load P and a central point moment M . The beam is supported at $x=0$ and $x=L$ by vertical reactions $-P \cdot \hat{j}$ and $-P \cdot \hat{j}_y$. The beam is also subjected to a central point moment $M \cdot \hat{k}$ at $x=L/2$. The deformed beam and the elastic curve are shown.

BONUS: Following the procedure used during the class lecture, set up and solve the differential equation to find an expression for P_{CR} for the case of a with Fixed-Pinned constraints.

$$P_{cr} = \frac{\pi^2}{0.7^2 L^2} \cdot E \cdot I$$

