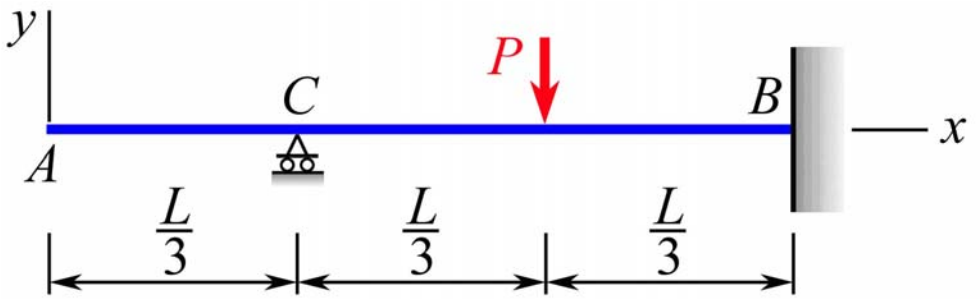
MEEG 3013 Quiz #9.m25.072

The beam shown has a constant *EI*. Using *moment-area theorems*, determine (*a*) the reaction $\mathbf{C}_y$ at *C*, (*b*) the slope θ_A at *A*.



Drawing of elastic-weight (*M*/*EI*) diagram by parts: ②

Sketch of elastic curve: ②

① Boundary condition, $t_{C/B} = (M_C)_{CB} = 0$: ①

$$\frac{4L}{9}\left[\frac{1}{2}\left(\frac{2L}{3}\right)\left(\frac{2C_yL}{3EI}\right)\right] - \left(\frac{2L}{3} - \frac{L}{9}\right)\left[\frac{1}{2}\left(\frac{L}{3}\right)\left(\frac{PL}{3EI}\right)\right] = 0$$

$$C_y = \frac{5P}{16} \qquad \mathbf{C}_y = \frac{5P}{16}\uparrow \quad ②$$

② Boundary condition, $\theta_{B/A} = A_{AB} = \theta_B - \theta_A = 0 - \theta_A = -\theta_A$: ①

$$\theta_A = -A_{AB} = -\left[\frac{1}{2}\left(\frac{2L}{3}\right)\left(\frac{2C_yL}{3EI}\right) - \frac{1}{2}\left(\frac{L}{3}\right)\left(\frac{PL}{3EI}\right)\right] = -\frac{PL^2}{72EI}$$

$$\theta_A = -\frac{PL^2}{72\,EI} \quad ②$$