

// sample slope and deflection equations

$$\begin{bmatrix} EI \frac{d(y(x))}{dx} = \frac{2\omega x^3}{3} - \frac{L\omega x^2}{2} \\ EI y(x) = \frac{7\omega x^4}{24} - \frac{L\omega x^3}{6} \end{bmatrix} \quad (1)$$

// midpoint of beam

$$x = \frac{L}{2} \quad (2)$$

// substitute into both equations

$$\begin{bmatrix} EI y' \left( \frac{L}{2} \right) = \frac{\omega \left( \frac{L}{2} \right)^3}{6} - \frac{L\omega \left( \frac{L}{2} \right)^2}{4} \\ EI y \left( \frac{L}{2} \right) = \frac{7\omega \left( \frac{L}{2} \right)^4}{24} - \frac{L\omega \left( \frac{L}{2} \right)^3}{6} \end{bmatrix} \quad (3)$$

// recreate first equation

$$\begin{bmatrix} EI y' \left( \frac{L}{2} \right) = \frac{\omega \left( \frac{L}{2} \right)^3}{6} - \frac{L\omega \left( \frac{L}{2} \right)^2}{4} \\ EI y \left( \frac{L}{2} \right) = \frac{7\omega \left( \frac{L}{2} \right)^4}{24} - \frac{L\omega \left( \frac{L}{2} \right)^3}{6} \end{bmatrix} \quad (4)$$

// slope and deflection at midpoint of beam (this works)

$$\begin{bmatrix} y' \left( \frac{L}{2} \right) = -\frac{L^3\omega}{24EI} \\ y \left( \frac{L}{2} \right) = -\frac{L^4\omega}{384EI} \end{bmatrix} \quad (5)$$

// (this doesn't)

$$\begin{bmatrix} 0 = -\frac{1}{24}L^3\omega \\ EI y \left( \frac{L}{2} \right) = -\frac{1}{384}L^4\omega \end{bmatrix} \quad (6)$$

// (this works)

$$\begin{bmatrix} EI y' \left( \frac{L}{2} \right) = -\frac{1}{24}L^3\omega \\ EI y \left( \frac{L}{2} \right) = -\frac{1}{384}L^4\omega \end{bmatrix} \quad (7)$$

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