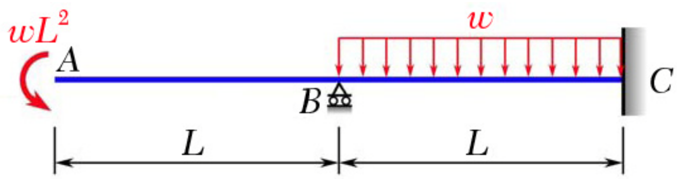
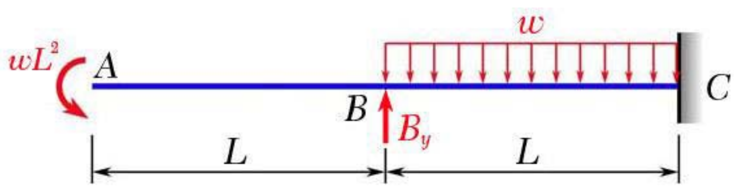
MEEG 3013 Quiz #9.m33.103

A beam with constant flexural rigidity EI is supported and loaded as shown. Using **method of integration**, determine for this beam (a) the reaction $\mathbf{B}_y$ at B, (b) the slope θ_A at A, (c) the deflection y_A at A.





$$q = -wL^2 < x >^{-2} - w < x - L >^0 + B_y < x - L >^{-1}$$
$$V = -wL^2 < x >^{-1} - w < x - L >^1 + B_y < x - L >^0$$
$$EIy'' = M = -wL^2 < x >^0 - \frac{w}{2} < x - L >^2 + B_y < x - L >^1$$
$$EIy' = -wL^2 < x >^1 - \frac{w}{6} < x - L >^3 + \frac{B_y}{2} < x - L >^2 + C_1$$
$$EIy = -\frac{wL^2}{2} < x >^2 - \frac{w}{24} < x - L >^4 + \frac{B_y}{6} < x - L >^3 + C_1 x + C_2 \quad ④$$

B.C.1: $y_B = y(L) = 0: \quad 0 = -\frac{wL^4}{2} + C_1 L + C_2$

B.C.2: $y_C = y(2L) = 0: \quad 0 = -2wL^4 - \frac{wL^4}{24} + \frac{B_y L^3}{6} + 2C_1 L + C_2$

B.C.3: $y'_C = y'(2L) = 0: \quad 0 = -2wL^3 - \frac{wL^3}{6} + \frac{B_y L^2}{2} + C_1$

Solution of the above three simultaneous equations yield:

$C_1 = \frac{59wL^3}{48}$ $\quad C_2 = -\frac{35wL^4}{48}$ $\quad B_y = \frac{15wL}{8}$ $\quad \theta_A = y'_A = y'(0) = \frac{C_1}{EI}$

$y_A = y(0) = \frac{C_2}{EI}$ $\quad \mathbf{B}_y = \frac{15wL}{8} \uparrow$ ② $\quad \theta_A = \frac{59wL^3}{48EI}$ ② $\quad y_A = -\frac{35wL^4}{48EI}$ ②