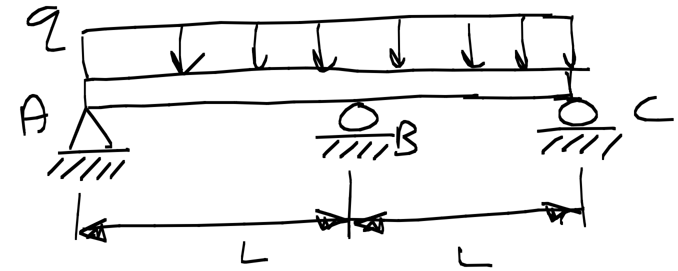
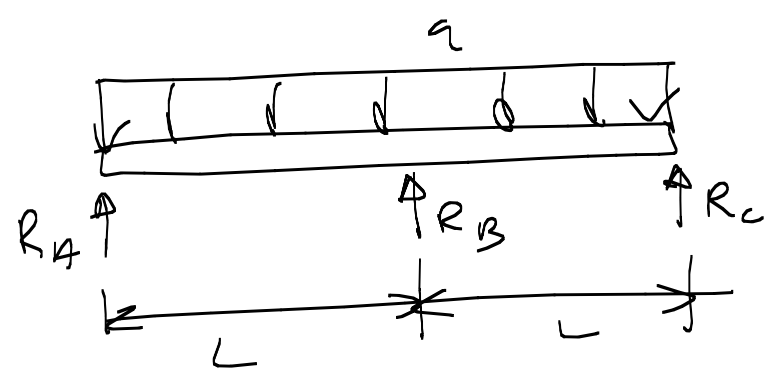
Problem 3

Determine



- Expressions for the deflection curve in terms of q, x, constants of integration, and the reaction at B
- State the boundary conditions necessary to solve for the unknowns



$+\uparrow \Sigma F_y \Rightarrow R_A + R_B + R_C - q(2L) = 0$

$+\circlearrowleft \Sigma M_A = 0$

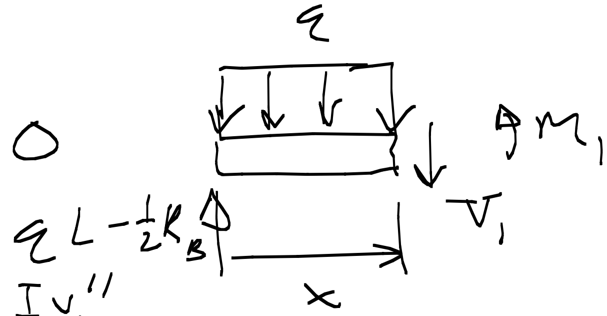
$-q(2L)(L) + R_B L + R_C(2L) = 0$

$$\boxed{R_C = qL - \tfrac{1}{2} R_B}$$

$$\boxed{R_A = qL - \tfrac{1}{2} R_B}$$

Two Segments

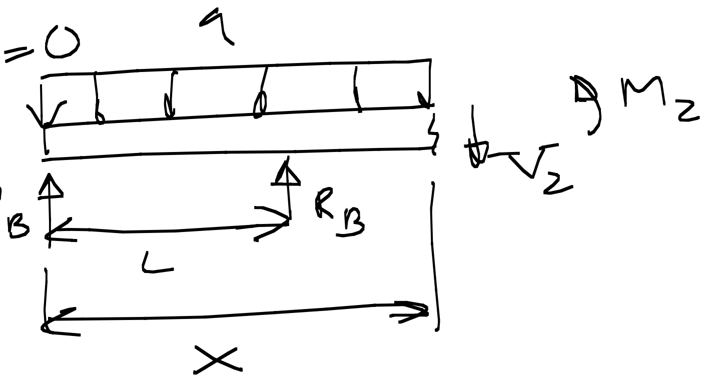
$0 \le x \le L$



$$\circlearrowleft + \quad \Sigma M_{cut} = 0 \Rightarrow M_1 + \frac{1}{2} q x^2 - \left(qL - \frac{1}{2}R_B\right)x = 0$$

$$\boxed{M_1 = -\frac{1}{2} q x^2 + qLx - \frac{1}{2} R_B x} = EI v_1''$$

$L \le x \le 2L$



$$\circlearrowleft + \quad \Sigma M_{cut} = 0 \Rightarrow M_2 - R_B(x - L) + \frac{1}{2} q x^2 - \left(qL - \frac{1}{2}R_B\right)x = 0$$

$qL - \frac{1}{2}R_B$

$$\boxed{M_2 = -\frac{1}{2} q x^2 + \frac{1}{2} R_B x - R_B L + qLx} = EI v_2''$$

$$EIv_1' = -\frac{1}{6} q x^3 + \frac{1}{2} qLx^2 + \frac{1}{4} R_B x^2 + C_1$$

$$EIv_2' = -\frac{1}{6} q x^3 + \frac{1}{4} R_B x^2 - R_B L x + \frac{1}{2} qLx^2 + C_2$$

$$EIv_1 = -\frac{1}{24}qx^4 + \frac{1}{6}qLx^3 + \frac{1}{12}R_Bx^3 + C_1x + C_3$$
$$EIv_2 = -\frac{1}{24}qx^4 + \frac{1}{12}R_Bx^3 - \frac{1}{2}R_BLx^2 + \frac{1}{6}qLx^3 + C_2x + C_4$$

Boundary Conditions (5)

$v_1(x=0) = 0$, $v_2(x=2L) = 0$, $v_1(x=L) = 0$

$v_1(x=L) = v_2(x=L) \Rightarrow v_2(x=L) = 0$

$v_1'(x=L) = v_2'(x=L)$