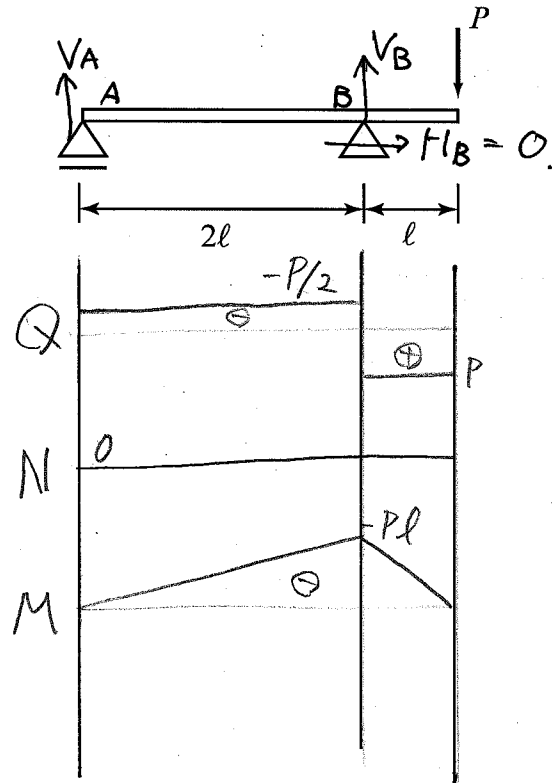


1. 右図の構造の反力と内力を求め図示せよ。

反力

$$\downarrow \sum V = -V_A - V_B + P = 0$$

$$\sum M_A = 2l \cdot V_B - 3l \cdot P = 0 \Rightarrow \begin{cases} V_A = -\frac{1}{2}P \\ V_B = \frac{3}{2}P \end{cases}$$



内力

i) $0 \leq x < 2l$

$$\downarrow \sum V = Q(x) - V_A = 0$$

$$\sum M_x = M(x) - V_A x = 0$$

$$\rightarrow \sum H = N(x) = 0$$

$$\begin{cases} Q(x) = -\frac{1}{2}P \\ M(x) = -\frac{1}{2}Px \\ N(x) = 0 \end{cases}$$

ii) $2l \leq x \leq 3l$

$$\downarrow \sum V = -Q(x) + P = 0$$

$$\sum M_x = -M(x) - P(3l-x) = 0$$

$$\rightarrow \sum H = -N(x) = 0$$

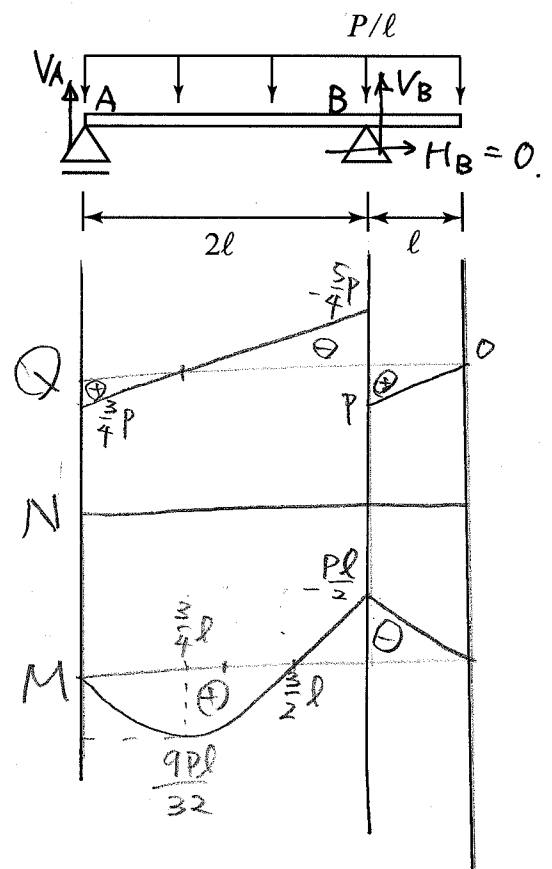
$$\begin{cases} Q(x) = P \\ M(x) = P(x-3l) \\ N(x) = 0 \end{cases}$$

2. 右図の構造の反力と内力を求め図示せよ。

反力

$$\downarrow \sum V = -V_A - V_B + \frac{P}{l} \cdot 3l = 0$$

$$\sum M_A = 2l \cdot V_B - \frac{3}{2}l \cdot \frac{P}{l} \cdot 3l = 0 \Rightarrow \begin{cases} V_A = \frac{3}{4}P \\ V_B = \frac{9}{4}P \end{cases}$$



内力

i) $0 \leq x < 2l$

$$\downarrow \sum V = Q(x) - V_A + \frac{P}{l}x = 0$$

$$\sum M_x = M(x) - V_A x + \frac{1}{2}x \cdot \frac{P}{l}x = 0$$

$$\rightarrow \sum H = N(x) = 0$$

$$\begin{cases} Q(x) = \frac{3}{4}P - \frac{P}{l}x \\ M(x) = -\frac{P}{2l}x^2 + \frac{3}{4}Px \\ N(x) = 0 \end{cases}$$

ii) $2l \leq x \leq 3l$

$$\downarrow \sum V = -Q(x) + \frac{P}{l}(3l-x) = 0$$

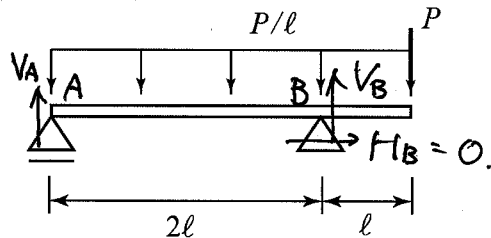
$$\sum M_x = -M(x) - \frac{3l-x}{2} \cdot \frac{P}{l}(3l-x) = 0$$

$$\rightarrow \sum H = -N(x) = 0$$

$$\begin{cases} Q(x) = 3P - \frac{P}{l}x \\ M(x) = -\frac{P}{2l}(3l-x)^2 \\ N(x) = 0 \end{cases}$$

裏面もあり。

3. 右図の構造の反力と内力を求め図示せよ。



外力

$$\downarrow \sum V = -V_A - V_B + P + \frac{P}{l} \cdot 3l = 0 \quad \left\{ \begin{array}{l} V_A = \frac{1}{4}P \\ V_B = \frac{15}{4}P \end{array} \right.$$

$$\sum M_A = 2l \cdot V_B - 3l \cdot P - \frac{3}{2}l \cdot \frac{P}{l} \cdot 3l = 0$$

内力

i) $0 \leq x < 2l$

$$\downarrow \sum V = Q(x) - V_A + \frac{P}{l} \cdot x = 0$$

$$\sum M_x = M(x) + \frac{x}{2} \cdot \frac{P}{l} \cdot x - x V_A = 0$$

$$\rightarrow \sum H = H(x) = 0$$

$$\left\{ \begin{array}{l} Q(x) = \frac{1}{4}P - \frac{P}{l}x \\ M(x) = \frac{1}{4}Px - \frac{P}{2l}x^2 \\ N(x) = 0 \end{array} \right.$$

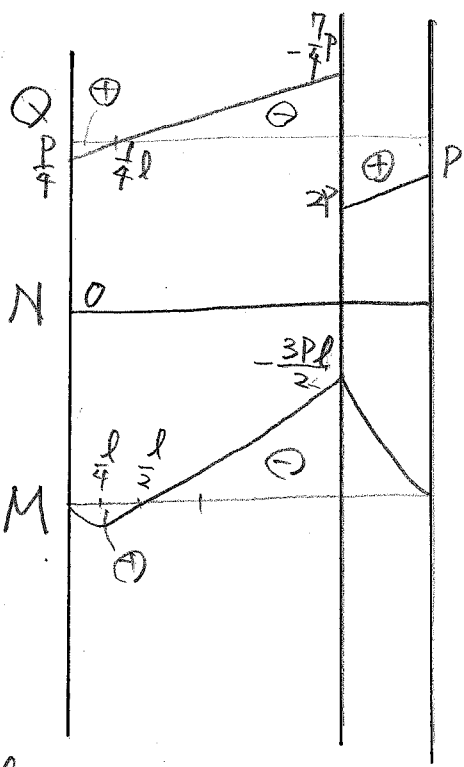
ii) $2l \leq x \leq 3l$

$$\downarrow \sum V = -Q(x) + \frac{P}{l}(3l-x) + P = 0$$

$$\sum M_x = -M(x) - \frac{3l-x}{2} \cdot \frac{P}{l}(3l-x) - (3l-x)P = 0$$

$$\rightarrow \sum H (= N(x)) = 0$$

$$\left\{ \begin{array}{l} Q(x) = 4P - \frac{P}{l}x \\ M(x) = -\frac{P}{2l}x^2 + 4Px - \frac{15}{2}Pl \\ N(x) = 0 \end{array} \right.$$



これ以降の回答は任意。
 4. 今日の講義に関する質問や意見などを自由に書いてください。
 5. 1と2と3の結果を比較して、考えられることを書きなさい。

4. Free body diagram is nice body diagram! thank you!

5. "同じの各反力や各内力"

= "向2の各反力や各内力" + "向1の"

例

$$M^1(x) + M^2(x) = \int \left(-\frac{1}{2}Px \right) + \left(-\frac{P}{2l}x^2 + \frac{3}{4}Px \right) \quad (0, 2l)$$

$$+ \int \left(P(x-3l) \right) + \left(-\frac{P}{2l}(3l-x)^2 \right) \quad (2l, 3l)$$

$$= M^3(x)$$