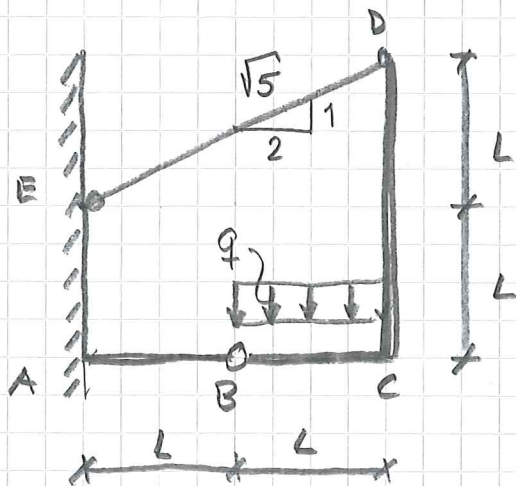
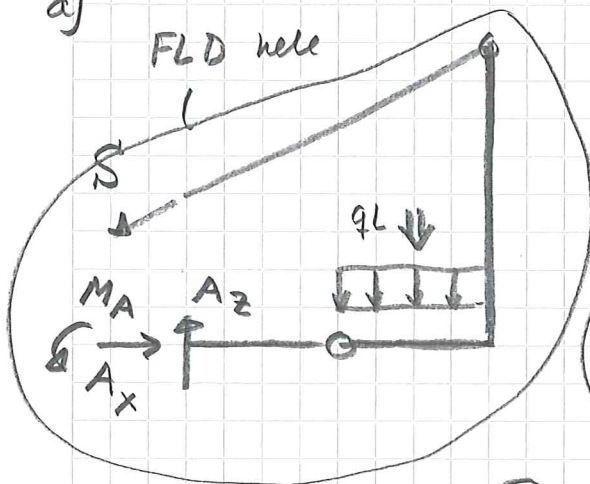


Oppgave 1

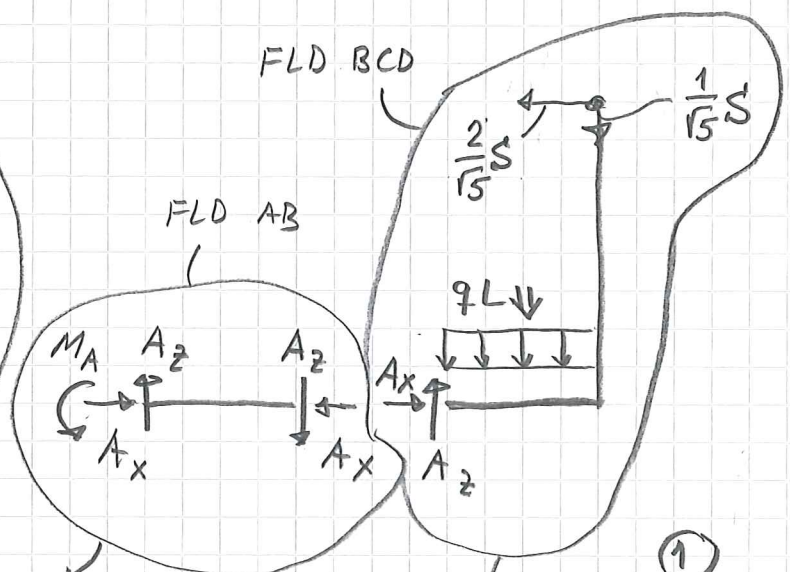
Geometri og belastning.



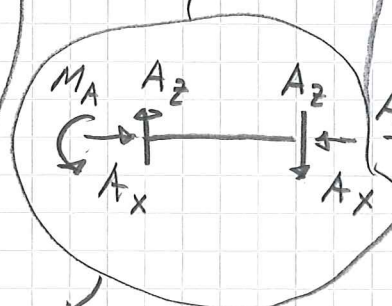
a)



FLD BCD



FLD AB



b)

$$\sum (\text{Moment})_A = 0 \Rightarrow$$

$$\underline{M_A = A_z \cdot L = \underline{\underline{\frac{7}{6} q L^2}}}$$

$$\sum (\text{Moment})_B = 0 \Rightarrow$$

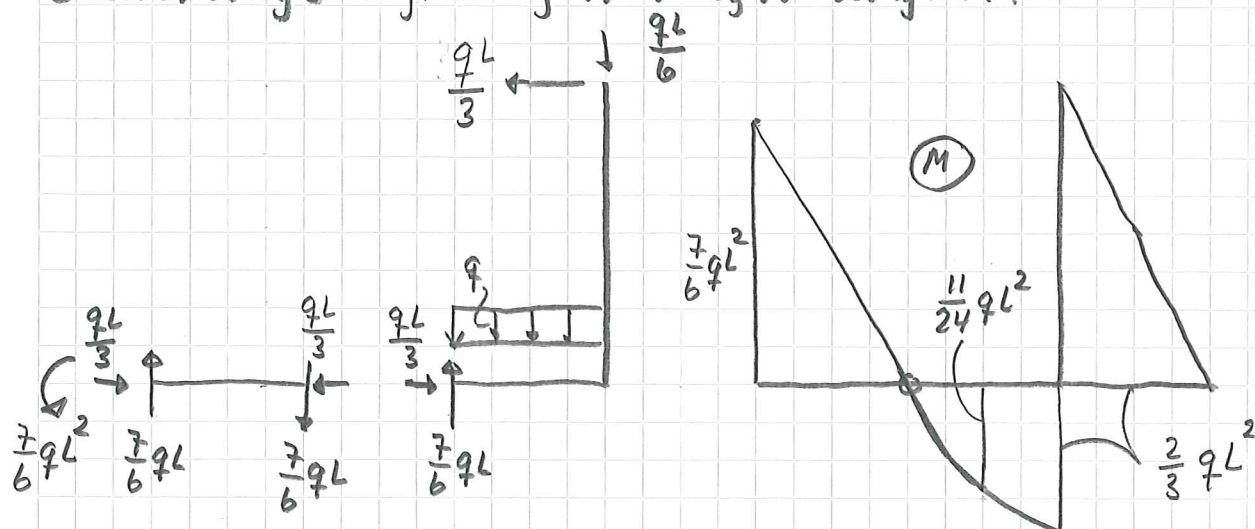
$$qL \cdot \frac{1}{2} + \frac{1}{\sqrt{5}} S \cdot L - \frac{2}{\sqrt{5}} S \cdot 2L = 0$$

$$\Rightarrow \underline{S = \frac{\sqrt{5}}{6} q L}$$

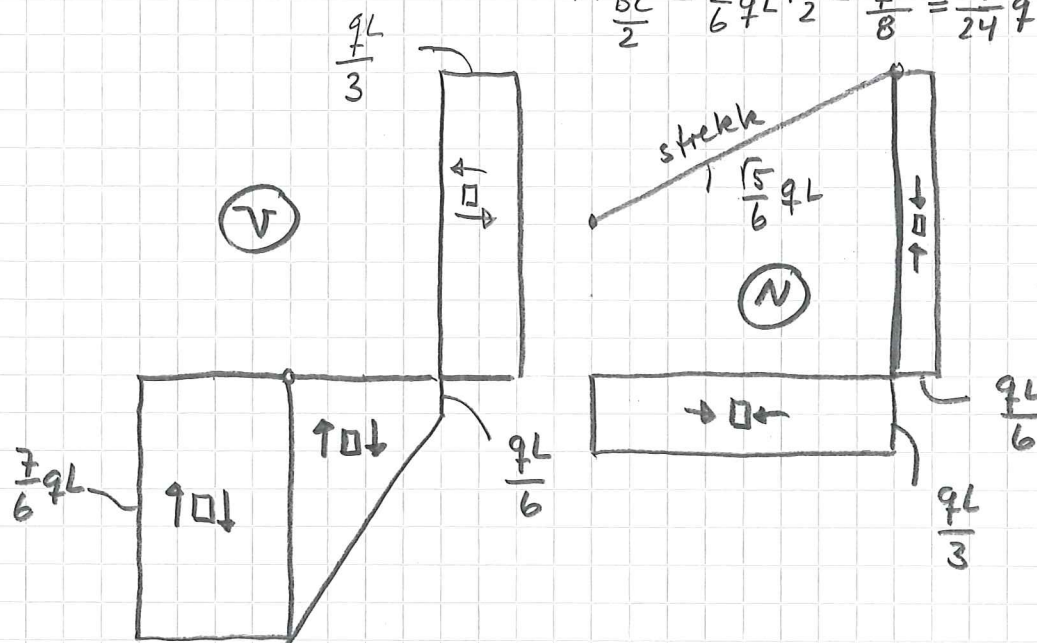
$$\rightarrow \sum F_x = 0 \Rightarrow \underline{A_x = \frac{2}{\sqrt{5}} S = \underline{\underline{\frac{q L}{3}}}}$$

$$\uparrow \sum F_z = 0 \Rightarrow \underline{A_z = qL + \frac{1}{\sqrt{5}} S = \underline{\underline{\frac{7}{6} q L}}}$$

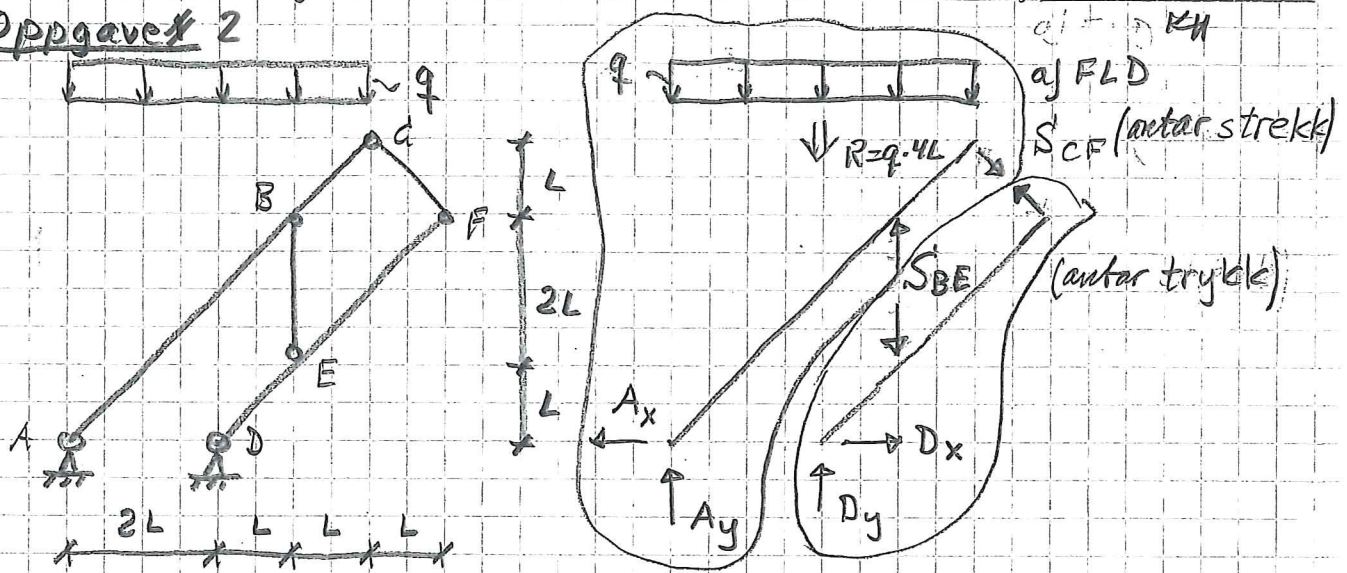
Belastningsdiagram og M-V- og N-diagram.



$$M_{\frac{BC}{2}} = \frac{7}{6}qL \cdot \frac{L}{2} - \frac{qL^2}{8} = \frac{11}{24}qL^2$$



Oppgave 2



b) Opplagerkrefter

$$\sum M_A = 0 \text{ for hele ramma} \Rightarrow q \cdot 4L \cdot 2L - D_y \cdot 2L = 0 \Rightarrow \underline{D_y = 4qL \uparrow}$$

$$\sum K_y = 0 \text{ for hele ramma} \Rightarrow A_y + D_y - q \cdot 4L = 0 \Rightarrow \underline{A_y = 0}$$

$$\sum M_H = 0 \text{ for DEF} \Rightarrow 4qL \cdot L - D_x \cdot 5L = 0 \Rightarrow \underline{D_x = \frac{4}{5}qL \rightarrow}$$

$$\sum K_x = 0 \text{ for DEF} \Rightarrow D_x - S_{CF} \frac{1}{\sqrt{2}} = 0 \quad (\text{strek})$$

$$\Rightarrow \underline{S_{CF} = \frac{4}{5}\sqrt{2}qL}$$

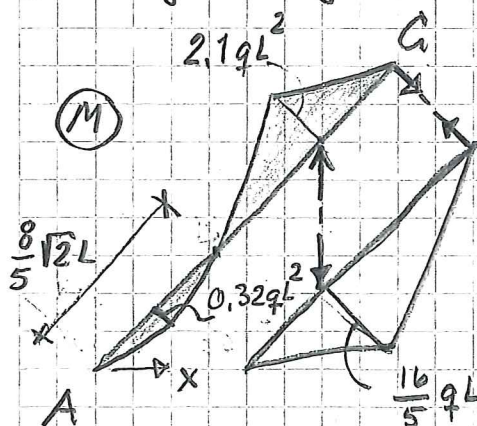
$$\sum M_D = 0 \text{ for DEF} \Rightarrow S_{BE} \cdot L - S_{CF} \cdot 3L \frac{1}{\sqrt{2}} = 0$$

$$\Rightarrow \underline{S_{BE} = \frac{24}{5}qL \quad (\text{trykk})}$$

Tilslutt: $\sum K_x = 0$ for hele ramma $\Rightarrow$

$$A_x = D_x \Rightarrow \underline{A_x = \frac{4}{5}qL \leftarrow}$$

c) M- og V-diagram



(Kun for ABC er det spurt om)

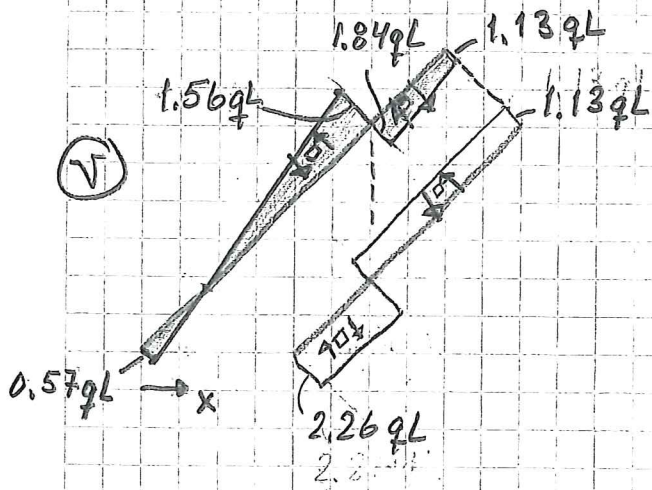
$$(M_E = S_{CF} \cdot 2L \frac{1}{\sqrt{2}} = \frac{16}{5}qL^2)$$

$$M(x) = A_x \cdot x - q \cdot x \cdot \frac{x}{2} = q \cdot x \left(\frac{4}{5}L - \frac{x}{2} \right)$$

$$\Rightarrow M\left(\frac{8}{5}L\right) = 0, \quad M(3L) = -\frac{21}{10}qL^2$$

$$\frac{dM}{dx} = \frac{4}{5}qL - qx = 0 \Rightarrow x = \frac{4}{5}L$$

$$M\left(\frac{4}{5}L\right) = \frac{16}{50}qL^2 = 0.32qL^2$$



$$(V_D = \frac{M_E}{L\sqrt{2}} = \frac{16}{5\sqrt{2}} qL = \frac{16\sqrt{2}}{10} qL = 2.26 qL)$$

$$(V_F = S_{CF} = 1.13 qL)$$

$$V_{B \text{ mot } G} = S_{CF} + qL \frac{\sqrt{2}}{2} = \frac{13}{10} \sqrt{2} qL = 1.84 qL$$

$$V_A = A_x \frac{\sqrt{2}}{2} = \frac{4\sqrt{2}}{10} qL = 0.57 qL$$

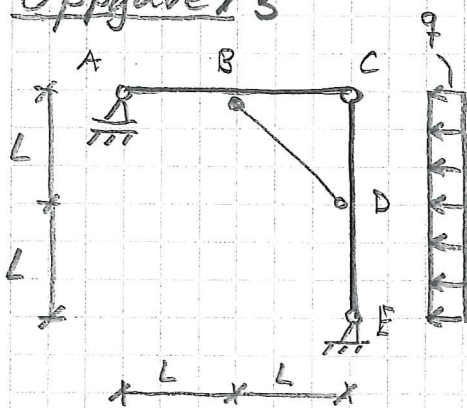
$$V_{B \text{ mot } A} = A_x \frac{\sqrt{2}}{2} - q \cdot 3L \frac{\sqrt{2}}{2} = -\frac{11}{10} \sqrt{2} qL = -1.56 qL$$



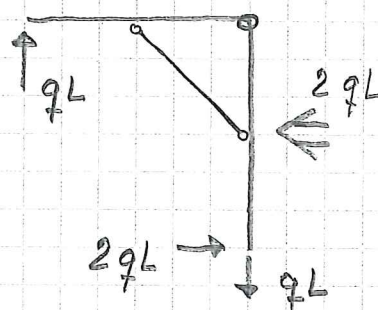
Øving 7

5/5

Oppgave 13

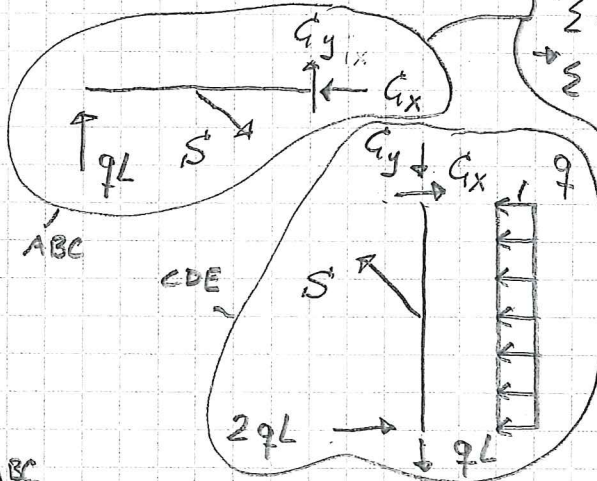


a) Opplagerkrefter



$$\begin{aligned}\sum K_x &= 0 \Rightarrow E_x = 2qL \\ \sum M_E &= 0 \Rightarrow A_y = qL \\ \sum K_y &= 0 \Rightarrow E_y = qL\end{aligned}$$

b) FLD for ABC og CDE



$$\begin{aligned}\sum M_D &= 0 \Rightarrow qL \cdot 2L - \frac{S}{\sqrt{2}} \cdot L = 0 \Rightarrow S = 2\sqrt{2}qL \\ \sum K_x &= 0 \Rightarrow \frac{S}{\sqrt{2}} - G_x = 0 \Rightarrow G_x = 2qL \\ \sum K_y &= 0 \Rightarrow qL - \frac{S}{\sqrt{2}} + G_y = 0 \Rightarrow G_y = qL\end{aligned}$$

Sjekk:

$$\begin{aligned}\sum K_x &= 2qL - 2qL - \frac{S}{\sqrt{2}} + G_x = 0 \text{ ok} \\ \sum K_y &= 0 \Rightarrow -qL + \frac{S}{\sqrt{2}} - G_y = 0 \text{ ok} \\ \sum M_E &= 0 \Rightarrow -2qL \cdot 2L + 2qL \cdot L + \frac{S}{\sqrt{2}} \cdot L = 0 \text{ ok}\end{aligned}$$

