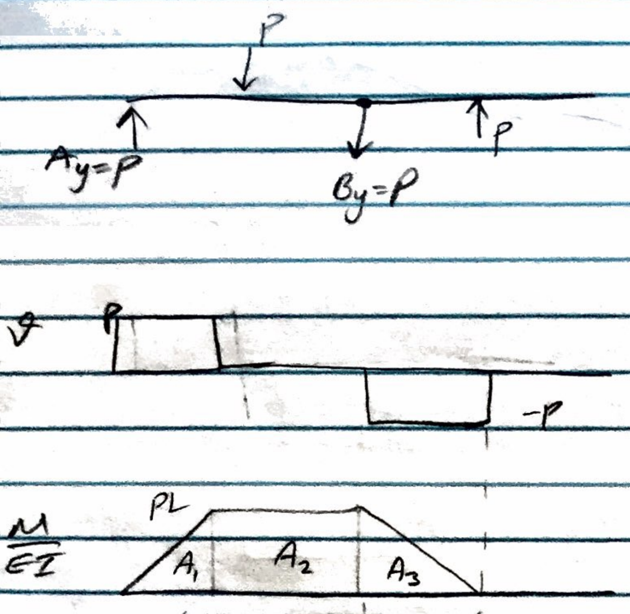
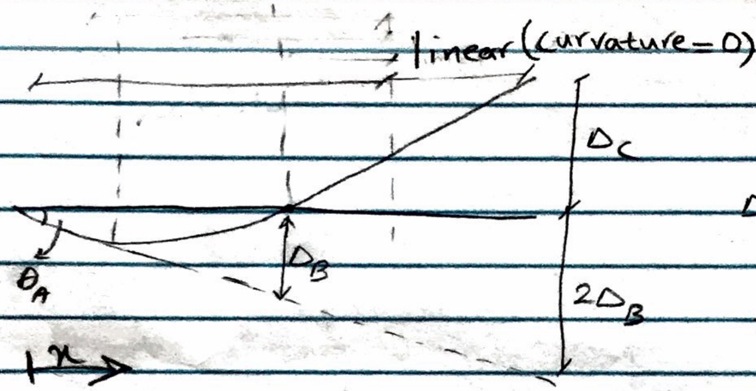


$$\circlearrowleft \sum M_A = 0 \Rightarrow +PL - B_y(2L) - P(3L) = 0$$
$$\Rightarrow B_y = -P \downarrow$$

$$\uparrow \sum F_y = 0 \Rightarrow P - P + P + A_y = 0 \Rightarrow A_y = P \uparrow$$



part (a) $\theta_A = \dfrac{\Delta_B}{2L}$

$$\Delta_B = A_1\left(L + \frac{L}{3}\right) + A_2\left(\frac{L}{2}\right)$$
$$= \left(\frac{1}{2}\frac{PL^2}{EI}\right)\left(\frac{4}{3}L\right) + \left(\frac{PL^2}{EI}\right)\left(\frac{L}{2}\right)$$
$$\Delta_B = \frac{7}{6}\frac{PL^3}{EI}$$

$$\boxed{\Rightarrow \theta_A = \frac{\Delta_B}{2L} = \frac{7}{12}\frac{PL^2}{EI}}$$

part (b) $t_{C/A} = \Delta_C + 2\Delta_B \Rightarrow \Delta_C = t_{C/A} - 2\Delta_B$

$$t_{C/A} = A_1\left(4L - \frac{2}{3}L\right) + A_2\left(2L + \frac{L}{2}\right) + A_3\left(L + \frac{2}{3}L\right)$$
$$= \left(\frac{1}{2}\frac{PL^2}{EI}\right)\left(\frac{10}{3}L\right) + (PL^2)\left(\frac{5}{2}L\right) + \left(\frac{1}{2}\frac{PL^2}{EI}\right)\left(\frac{5}{3}L\right) = 5\,PL^3/EI$$

$$\boxed{\Rightarrow \Delta_C = \frac{5PL^3}{EI} - 2\left(\frac{7}{6}\frac{PL^3}{EI}\right) = \frac{8}{3}\frac{PL^3}{EI}}$$

part (c) Curvature is constant where $\frac{M}{EI}$ is constant, i.e.:

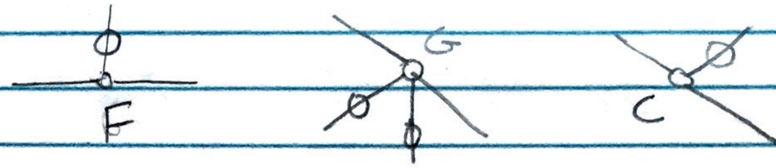
$L \le x \le 2L$

and

$3L \le x \le 4L$

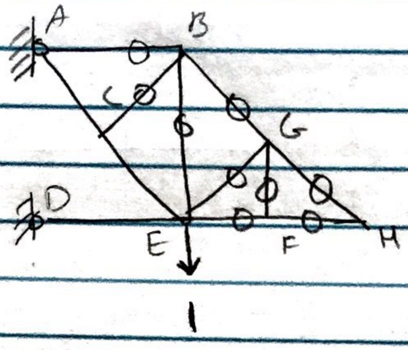
Problem 2)

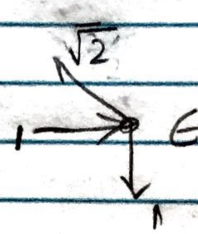
part (a)



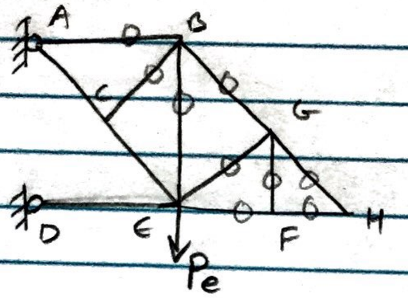
$F_{FG} = F_{GE} = F_{CB} = 0$

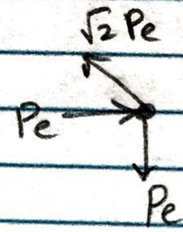
part (b)





Virtual

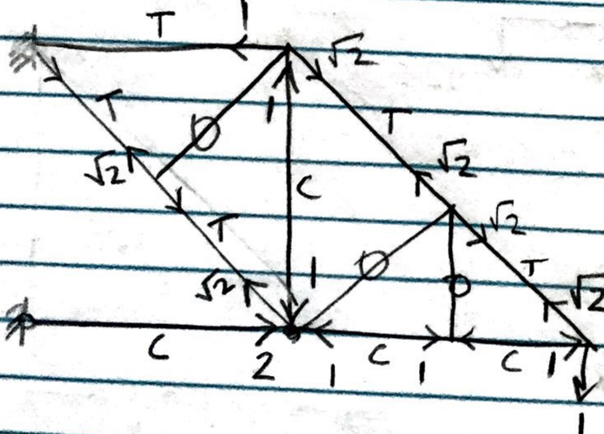




Real

	L/AE	f_e	F_e	$f_e F_e L/AE$
AC	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}P_e$	$2\sqrt{2}LP_e/AE$
CE	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}P_e$	$2\sqrt{2}LP_e/AE$
DE	$2L/AE$	-1	$-P_e$	$2LP_e/AE$
Σ				$\boxed{(2+4\sqrt{2})LP_e/AE = \Delta_e}$

part (c)



	L/AE	f_h	F_h	$f_h F_h L/AE$
FH	L/AE	-1	$-P_h$	LP_h/AE
GH	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}P_h$	$2\sqrt{2}LP_h/AE$
EF	L/AE	-1	$-P_h$	LP_h/AE
BG	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}P_h$	$2\sqrt{2}LP_h/AE$
BE	$2L/AE$	-1	$-P_h$	$2LP_h/AE$
AB	$2L/AE$	1	P_h	$2LP_h/AE$
AC	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}P_h$	$2\sqrt{2}LP_h/AE$
CE	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}P_h$	$2\sqrt{2}LP_h/AE$
DE	$2L/AE$	-2	$-2P_h$	$8LP_h/AE$
Σ				$(14+8\sqrt{2})\dfrac{LP_h}{AE}$

$= \Delta_H$

part (d) $f_{11} = \Sigma f_e f_e L/AE = (2+4\sqrt{2})L/AE$

$f_{22} = \Sigma f_h f_h L/AE = (14+8\sqrt{2})L/AE$

$f_{12} = f_{21} = \Sigma f_e f_h L/AE$

note: $f_e \neq 0$ only for members AC, CE and DE, so:

	L/AE	f_e	f_h	$f_e f_h L/AE$
AC	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}$	$2\sqrt{2}L/AE$
CE	$\sqrt{2}L/AE$	$\sqrt{2}$	$\sqrt{2}$	$2\sqrt{2}L/AE$
DE	$2L/AE$	-1	-2	$4L/AE$
Σ				$(4+4\sqrt{2})L/AE = f_{12} = f_{21}$

$$\Rightarrow F = \begin{bmatrix} f_{11} & f_{12} \\ f_{21} & f_{22} \end{bmatrix} = \frac{L}{AE}\begin{bmatrix} (2+4\sqrt{2}) & (4+4\sqrt{2}) \\ (4+4\sqrt{2}) & (14+8\sqrt{2}) \end{bmatrix}$$