PROB. 6.49

FIND FORCES IN DF, DG, EG.

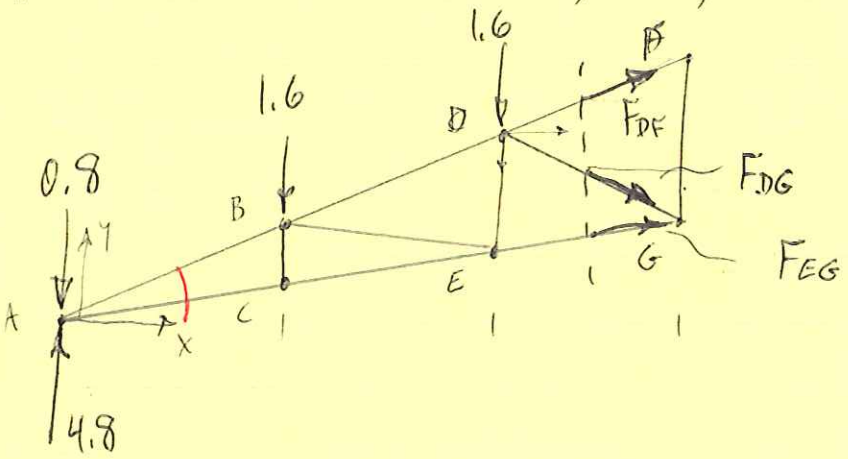
FIND REACTIONS AT A AND L:

$\Sigma F_Y = 0$: $R_A + R_L = 9.6$

BY SYMMETRY, $R_A = R_L$

$R_A = R_L = 4.8$ KIPS

PASS SECTION THROUGH DF, DG, EG:



FOR $\vec{F}_{DF}$: $\theta = \tan^{-1}\left(\frac{10.5}{24}\right) = 23.6°$

$\vec{F}_{DF} = (\cos 23.6° F_{DF})\hat{i} + (\sin 23.6° F_{DF})\hat{j}$ KIPS

$\vec{F}_{DF} = (0.916 F_{DF})\hat{i} + (0.4 F_{DF})\hat{j}$ KIPS

FOR $\vec{F}_{DG}$:

PROB. 6.49

$X_D = 16'$, $\frac{Y_D}{16} = \tan 23.6°$, $Y_D = 6.99$ ft

$X_G = 24'$, $Y_G = 4.5$ ft

$dx = X_G - X_D = 8$, $dy = Y_G - Y_D = 4.5 - 6.99 = -2.49$ ft

$d = \sqrt{8^2 + (2.49)^2} = 8.38$ ft

$$\vec{F}_{DG} = \left[\left(\frac{8}{8.38}\right) F_{DG}\right] \hat{i} + \left[\left(\frac{-2.49}{8.38}\right) F_{DG}\right] \hat{j}$$

$$\vec{F}_{DG} = (0.955\, F_{DG})\, \hat{i} + (-0.297\, F_{DG})\, \hat{j} \text{ KIPS}$$

FOR $\vec{F}_{EG}$: $\theta = \tan^{-1}\left(\frac{4.5}{24}\right) = 10.6°$

$$\vec{F}_{EG} = (\cos 10.6°\, F_{EG})\, \hat{i} + (\sin 10.6°\, F_{EG})\, \hat{j}$$

$$\vec{F}_{EG} = (0.983\, F_{EG})\, \hat{i} + (0.184\, F_{EG})\, \hat{j} \text{ KIPS}$$

$\Sigma M_G = 0 \; +\circlearrowleft$

$$-(24\text{ft})(4.8\text{ KIPS}) + (24)(0.8) + (16)(1.6) + (8)(1.6)$$

$$-(6)(0.916\, F_{DF}) = 0$$

$$\boxed{F_{DF} = -10.48 \text{ KIPS}} \quad \text{(COMPRESSION)}$$

PROB. 6.49

POINT E: $X_E = 16$ ft $\quad Y_E = 16 \tan(10.6°) = 2.99$ ft

DISTANCE FROM D TO E: $6.99 - 2.99 = 4$ ft

$\Sigma M_D = 0 \quad +\circlearrowleft$

$-(16\text{ ft})(4.8\text{ KIPS}) + (16)(0.8) + (8)(1.6) + (4)(0.983\ F_{EG}) = 0$

$\boxed{F_{EG} = 13.0\text{ KIPS}}$ (TENSION)

$\Sigma M_A = 0 \quad +\circlearrowleft$

$-(8\text{ ft})(1.6\text{ KIPS}) - (16)(1.6) - (7)(0.955\ F_{DG})$ ~~EIGHT~~

$-(16)(0.297\ F_{DG}) = 0$

$-38.4 - 11.4\ F_{DG} = 0$

$\boxed{F_{DG} = -3.37\text{ KIPS}}$ (COMPRESSION)