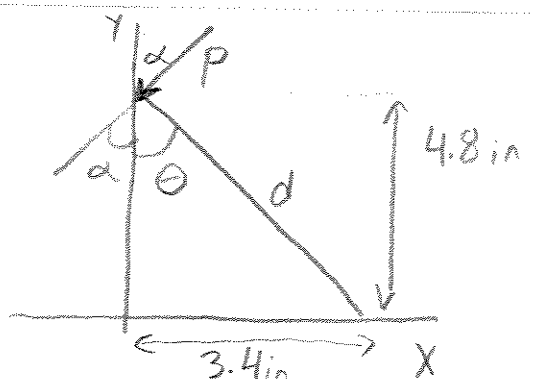
MAE 206 HW 2 # 3.4

3.41



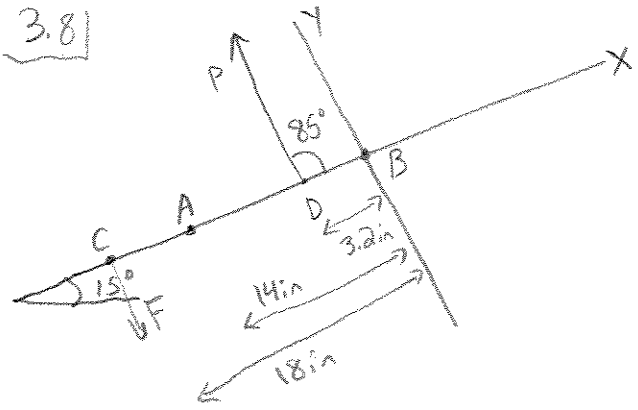
$M_A = Fd = 19.5 \text{ lb} \cdot \text{in}$

$d = \sqrt{(3.4\text{ in})^2 + (4.8\text{ in})^2} = 5.88\text{ in}$

$19.5 \text{ lb} \cdot \text{in} = F(5.88\text{ in})$ $\quad \boxed{F = 3.32 \text{ lb}}$

$\alpha = 90° - \tan^{-1}\frac{3.4\text{ in}}{4.8\text{ in}} = \boxed{57.4° = \alpha}$

3.81



$W = 5\ lb$

$d_{A-B} = 14\ in$

$d_{D-B} = 3.2\ in$

$d_{C-B} = 18\ in$

$M_B = d_{A-B} \cos 15° \cdot W = 67.6\ lb \cdot in \circlearrowright$

$M_B = d_{D-B}\ P \cos 5°$

$P = 21.2\ lb$

For F_{min}, F must be $\perp$ to BC

$M_B = d_{CB}\ F_{min}$

$F_{min} = 3.76\ lb$ 75° below horizontal

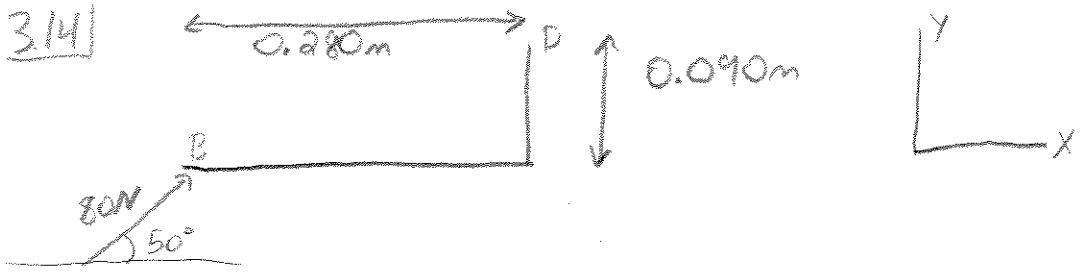
$M_B = 67.6\ lb \cdot in \circlearrowright$

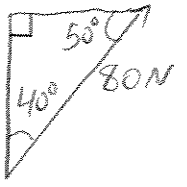
$P = 21.2\ lb$

$F_{min} = 3.76\ lb$ 75° below horizontal

MAE 206 HW2 # 3.14

3.14





$\vec{F} = 80N\cos 50^\circ \uparrow + 80N\sin 50^\circ \hat{\jmath}$

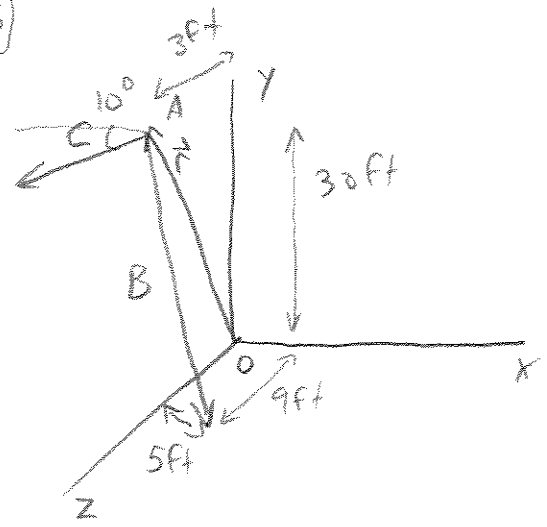
$= 51.423 \uparrow + 61.284 \hat{\jmath}$

$M_D = \vec{r} \times \vec{F} = \begin{vmatrix} \uparrow & \hat{\jmath} \\ 0.280m & .090m \\ 51.423 & 61.284 \end{vmatrix}$

$M_D = 12.5\ N \cdot m \circlearrowright$

MAE 206 HW 2 # 3.23

3.23)



$\vec{r}$: $\langle 0\,ft,\ 30\,ft,\ 3\,ft \rangle$

$\vec{T}_{AC} = -62\,lb \cos 10^\circ \uparrow - 62\,lb \sin 10^\circ \hat{\jmath}$

$\vec{T}_{AC} = -61.058\,lb \uparrow - 10.766\,lb \hat{\jmath}$

$\vec{AB}$: $\langle 5\,ft,\ -30\,ft,\ 6\,ft \rangle$

$|\vec{AB}| = \sqrt{(5ft)^2 + (30ft)^2 + (6ft)^2}$

$|\vec{AB}| = 31\,ft$

$\vec{T}_{AB} = 62\,lb \dfrac{\vec{AB}}{|\vec{AB}|}$

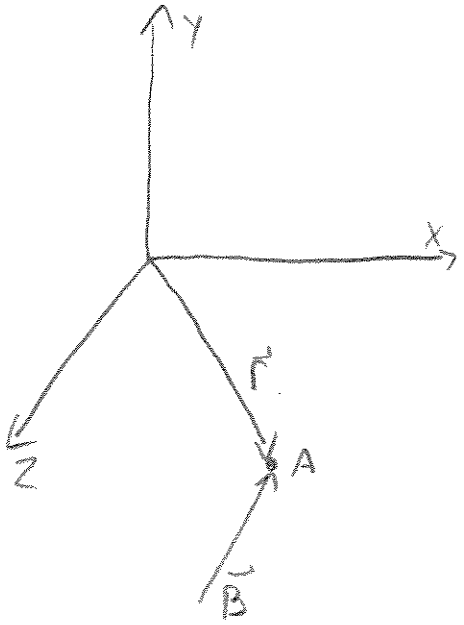
$\vec{T}_{AB} = \langle 10\,lb,\ -60\,lb,\ 12\,lb \rangle$

$\vec{R} = \vec{T}_{AC} + \vec{T}_{AB} = \langle -51.058\,lb,\ -70.766\,lb,\ 12\,lb \rangle$

$$\vec{M}_O = \vec{r} \times \vec{R} = \begin{vmatrix} \uparrow & \hat{\jmath} & \hat{k} \\ 0 & 30 & 3 \\ -51.058 & -70.766 & 12 \end{vmatrix} lb \cdot ft$$

$\vec{M}_O = 572\,lb\,ft \uparrow - 153\,lb \cdot ft \hat{\jmath} + 1530\,lb \cdot ft \hat{k}$

3.26



$\vec{r} = \langle 0.96m\,\hat{\uparrow} - 0.12m\,\hat{J} + 0.72m\,\hat{K} \rangle$

$\vec{B} = \langle 1.06m\,\hat{\uparrow} - 1.92m\,\hat{J} + 1.32m\,\hat{K} \rangle$

$\vec{A} = \langle 0.96m\,\hat{\uparrow} - 0.12m\,\hat{J} + 0.72m\,\hat{K} \rangle$

$\vec{BA} = \langle -0.1m\,\hat{\uparrow} + 1.8m\,\hat{J} - 0.6m\,\hat{K} \rangle$

$|\vec{BA}| = \sqrt{(0.1m)^2 + (1.8m)^2 (0.6m)^2}$

$|\vec{BA}| = 1.90m$

$$\vec{M} = \vec{r} \times \vec{BA} = \frac{228N}{1.9m} \begin{vmatrix} \hat{\uparrow} & \hat{J} & \hat{K} \\ 0.96m & -0.12m & 0.72m \\ -0.1m & 1.8m & -0.6m \end{vmatrix}$$

$\vec{M} = -147\ Nm\,\hat{\uparrow} + 60.5\ Nm\,\hat{J} + 206\ Nm\,\hat{K}$