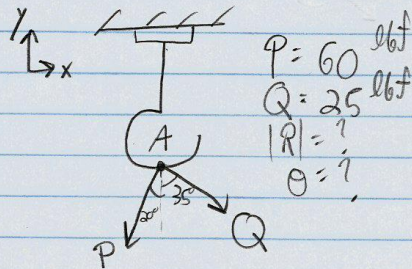
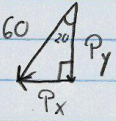


2.2



$P = 60 \text{ lbf}$   
 $Q = 25 \text{ lbf}$   
 $|R| = ?$   
 $\theta = ?$

$P_0$



$$P_x = \sin 20^\circ \cdot 60 \text{ lbf}$$

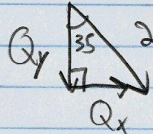
$$= -20.52 \hat{i}$$

$$P_y = \cos 20^\circ \cdot 60$$

$$= -56.38 \hat{j} \text{ lbf}$$

$$\vec{P} = -20.52 \hat{i} - 56.38 \hat{j} \text{ lbf}$$

$Q_0$



$$Q_x = \sin 35^\circ \cdot 25 \text{ lbf}$$

$$= 14.34 \hat{i}$$

$$Q_y = \cos 35^\circ \cdot 25$$

$$= -20.48 \hat{j} \text{ lbf}$$

$$\vec{Q} = 14.34 \hat{i} - 20.48 \hat{j} \text{ lbf}$$

$$\vec{R} = \vec{P} + \vec{Q}$$

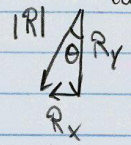
$$= -20.52 \hat{i} - 56.38 \hat{j} + 14.34 \hat{i} - 20.48 \hat{j} \text{ lbf}$$

$$= -6.18 \hat{i} - 76.86 \hat{j} \text{ lbf}$$

$$|R| = \sqrt{(-6.18)^2 + (-76.86)^2} = (38.19 + 5907.46)^{1/2}$$

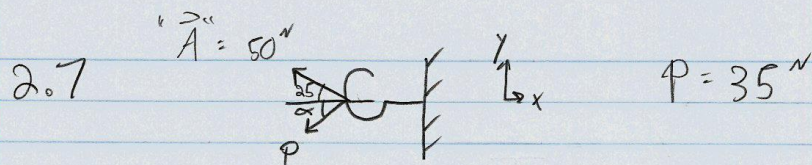
$$|R| = 77.11 \text{ lbf}$$

$$\tan \theta = \frac{R_x}{R_y} = \frac{-6.18}{-76.86}$$



$$\theta = \arctan(0.0804)$$

$$\theta = 4.60^\circ$$



$$\underline{R_j = 0}$$

$\vec{A}$ :

$$A_y = \sin 25 \cdot 50 = 21.13\text{ j}$$

$$A_x = \cos 25 \cdot 50 = -45.32\text{ i}$$

$$\vec{A} = -45.32\text{ i} + 21.13\text{ j}$$

$P$ :

$$P_y = \sin \alpha \cdot 35$$

$$R_j = P_y + A_y = 0$$

$$\sin \alpha \cdot 35 + 21.13 = 0$$

$$\sin \alpha = \frac{21.13}{35}$$

$$\Rightarrow \alpha = \arcsin\left(\frac{21.13}{35}\right)$$

$$\alpha = 37.14^\circ$$

$$P_x = \cos \alpha \cdot 35$$

$$= -27.90\text{ i}$$

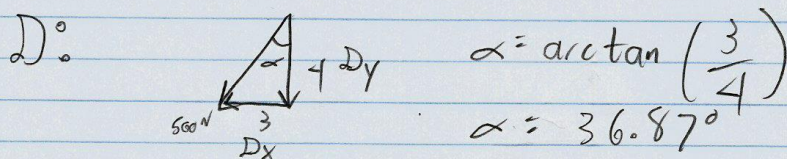
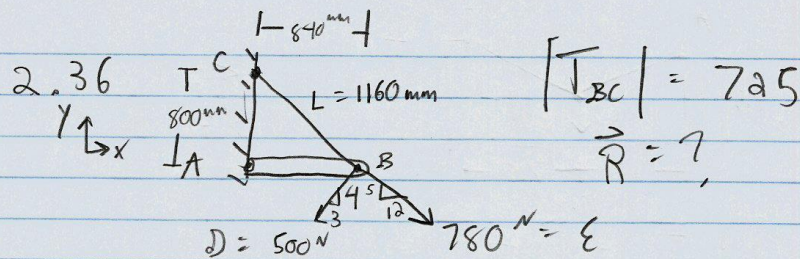
$$\vec{P} = -27.9\text{ i} - 21.13\text{ j}$$

$$\vec{R} = \vec{P} + \vec{A} = (-27.9 - 45.3)\text{ i} + (-21.13 + 21.13)\text{ j}$$

$$\vec{R} = 73.2\text{ i} + 0\text{ j}$$

$$\underline{|R| = 73.2\text{ N}}$$

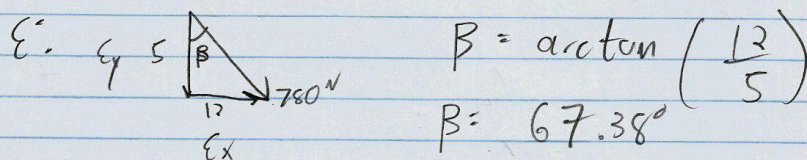
$$|R| = \sqrt{73.2^2 + 0^2}$$



$$D_x = \sin \alpha \cdot 500 = -300\text{ N}$$

$$D_y = \cos \alpha \cdot 500 = -400\text{ N}$$

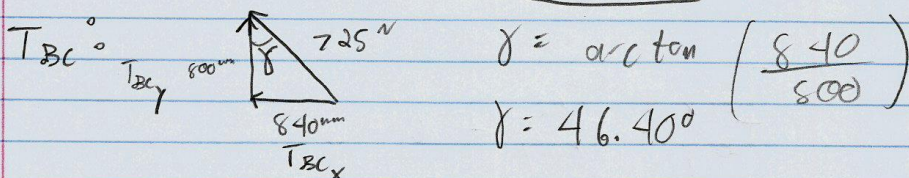
$$\vec{D} = -300\vec{i} - 400\vec{j}\text{ N}$$



$$E_x = \sin \beta \cdot 780 = 720\text{ N}$$

$$E_y = \cos \beta \cdot 780 = 300\text{ N}$$

$$\vec{E} = 720\vec{i} - 300\vec{j}\text{ N}$$



$$T_{BCx} = \sin \gamma \cdot 725 = -525\text{ N}$$

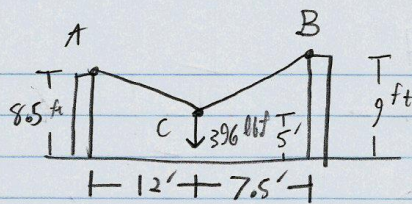
$$T_{BCy} = \cos \gamma \cdot 725 = 500\text{ N}$$

$$\vec{T}_{BC} = -525\vec{i} + 500\vec{j}\text{ N}$$

$$\vec{R} = \vec{D} + \vec{E} + \vec{T}_{BC} = (-300 + 720 - 525)\vec{i} + (-400 - 300 + 500)\vec{j}\text{ N}$$

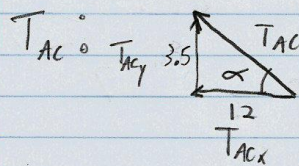
$$\vec{R} = -105\vec{i} - 200\vec{j}\text{ N}$$

2.130



$$\begin{aligned}\sum F &= 0 \\ \sum F_y &= 0 \\ \sum F_x &= 0\end{aligned}$$

$$\vec{P} = \vec{T}_{AC} + \vec{C} + \vec{T}_{BC} = 0$$

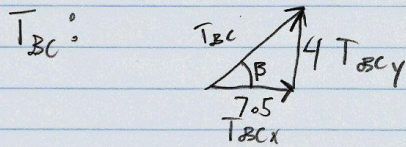


$$\delta_{T_{ACy}} = 8.5 - 5 = 3.5$$

$$\alpha = \arctan\left(\frac{3.5}{12}\right) = 16.26^\circ$$

$$T_{ACy} = \sin \alpha |T_{AC}| = .28 T_{AC}$$

$$T_{ACx} = -\cos \alpha |T_{AC}| = -.96 T_{AC}$$



$$\delta_{T_{BCy}} = 9 - 5 = 4$$

$$\beta = \arctan\left(\frac{4}{7.5}\right) = 28.07^\circ$$

$$\begin{aligned}T_{BCy} &= \sin \beta T_{BC} = .4705 T_{BC} \\ T_{BCx} &= \cos \beta T_{BC} = .8824 T_{BC}\end{aligned}$$

$$\begin{aligned}T_{BCx} + T_{ACx} &= 0 \\ T_{BCy} + T_{ACy} - 396 &= 0\end{aligned}$$

$$.8824 T_{BC} - .96 T_{AC} = 0$$

$$.4705 T_{BC} + .28 T_{AC} = 396$$

$$\begin{aligned}T_{AC} &= 500.1 \text{ lb} \\ T_{BC} &= 544.1 \text{ lb}\end{aligned}$$