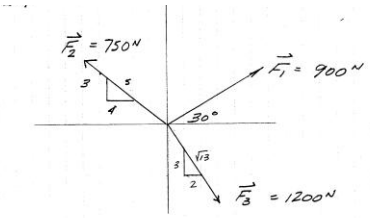
Assignement #1 Somution

1)

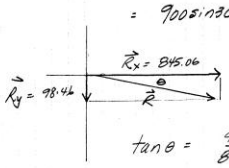



$R_x = \Sigma F_x = F_1 \cos 30 - \frac{4}{5} F_2 + \frac{2}{\sqrt{13}} F_3$

$= 900 \cos 30 - \frac{4}{5}(750) + \frac{2}{\sqrt{13}} 1200 = 845.06^N$

$R_y = \Sigma F_y = F_1 \sin 30 + \frac{3}{5}(F_2) - \frac{3}{\sqrt{13}} F_3$

$= 900 \sin 30 + \frac{3}{5}(750) - \frac{3}{\sqrt{13}} 1200 = -98.46^N$




$R = \sqrt{845.06^2 + (-98.46)^2}$

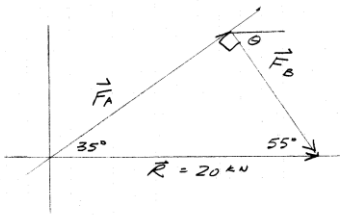
$R = 850.78^N$

$\tan\theta = \frac{98.46}{845.06} = 0.1165$

$\theta = 6.65°$

$\vec{R} = 850.78^N \angle 6.65°$

2)

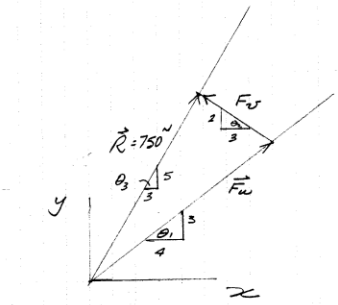



For $\vec{F_B}$ minimum $F_B$ is $\perp$ to $F_A$

$\sin 35° = \frac{F_B}{20}$ $\quad F_B = 20 \sin 35° = 11.47\,kN$

$\cos 35° = \frac{F_A}{20}$ $\quad F_A = 20 \cos 35° = 16.38\,kN$

3)




$\tan\theta_1 = \frac{3}{4}$

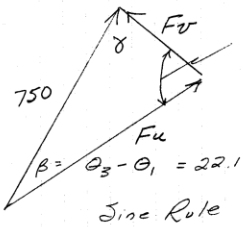
$\theta_1 = 36.87$

$\tan\theta_2 = \frac{2}{3}$

$\theta_2 = 33.69°$

$\tan\theta_3 = \frac{5}{3}$

$\theta_3 = 59.04°$




$\theta_1 + \theta_2 = 70.56°$

$\gamma = 180 - (\theta_1 + \theta_2) - \beta$

$= 180 - 70.56 - 22.17 =$

$\beta = \theta_3 - \theta_1 = 22.17°$

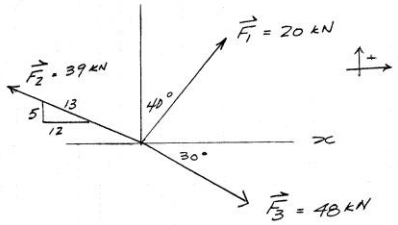
Sine Rule

$\frac{750}{\sin 70.56} = \frac{F_W}{\sin 87.27} = \frac{F_U}{\sin 22.17}$

$F_W = \frac{750}{\sin 70.56^\circ} \sin 87.27° = 794.44^N$

$F_U = \frac{750}{\sin 70.56} \sin 22.17 = 300.13^N$

Bonus




$R_x = \Sigma F_x = F_1 \sin 40° - \frac{12}{13} F_2 + F_3 \cos 30°$

$= 20 \sin 40° - \frac{12}{13}(39) + 48 \cos 30°$

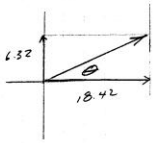
$R_x = 18.42\,kN$ $\quad \vec{R_x} = 18.42\,kN \rightarrow$

$R_y = \Sigma F_y = F_1 \cos 40° + \frac{5}{13} F_2 - F_3 \sin 30°$

$= 20 \cos 40° + \frac{5}{13}(39) - 48 \sin 30°$

$R_y = 6.32\,kN$ $\quad \vec{R_y} = 6.32\,kN \uparrow$

$R = \sqrt{R_x^2 + R_y^2} = \sqrt{18.42^2 + 6.32^2} = 19.47\,kN$




$\tan\theta = \frac{6.32}{18.42} = 0.3431$

$\theta = 18.94°$

$\vec{R} = 19.47\,kN \angle 18.94°$