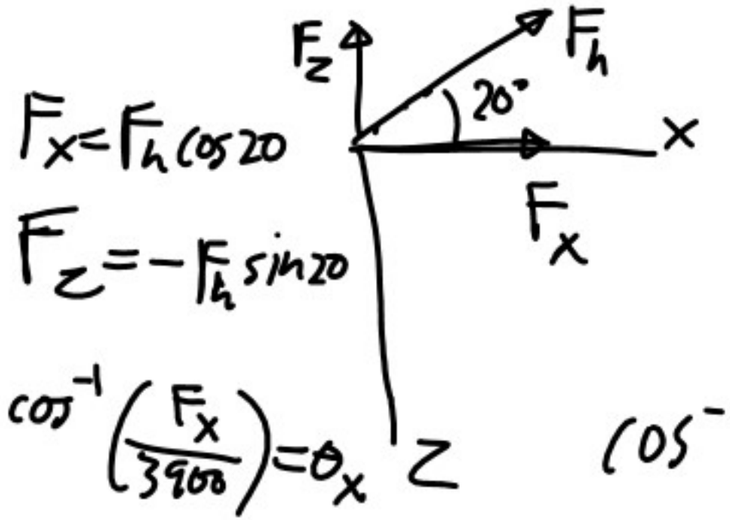
Tuesday 9:30 – 6:00

Friday 9:00 - 5:00

Wednesday - Friday by appointment

2.77 Cable AB is 65 ft long, and the tension in that cable is 3900 lb. Determine (a) the x, y, and z components of the force exerted by the cable on the anchor B, (b) the angles θ_x, θ_y, and θ_z defining the direction of that force.



$F_x = F_h \cos 20$

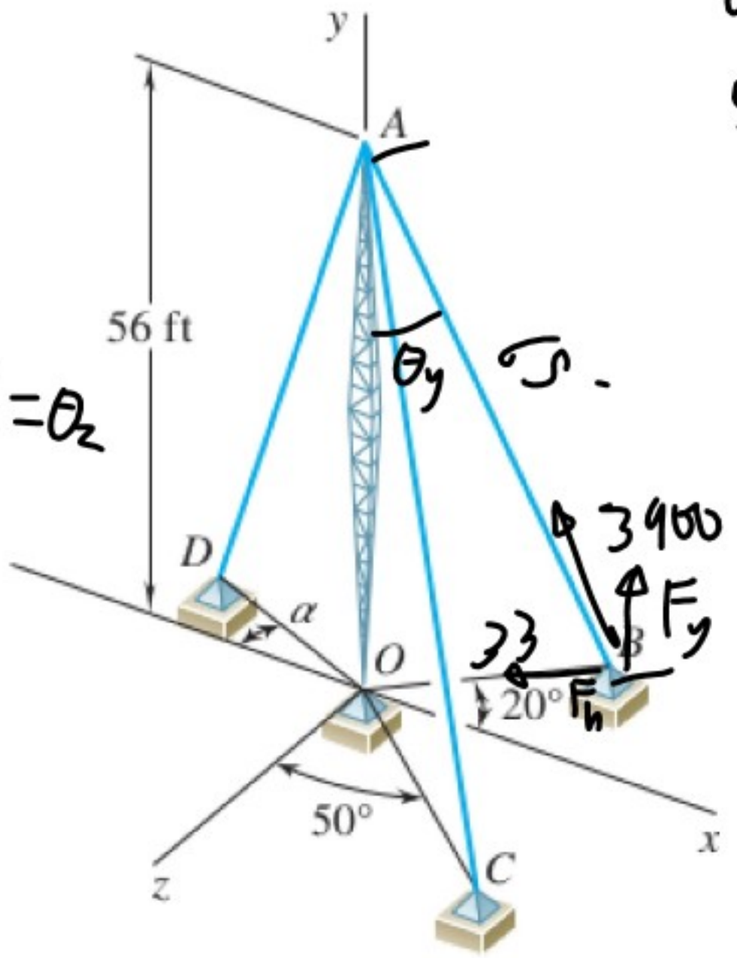
$F_z = -F_h \sin 20$

$\cos^{-1}\left(\frac{F_x}{3900}\right) = \theta_x$

$\cos^{-1}\left(\frac{F_z}{3900}\right) = \theta_z$

$\cos^2\theta_x + \cos^2\theta_z + \cos^2\theta_y = 1$

$\theta_z = \sqrt{\cos^{-1}(1 - \cos^2\theta_x - \cos^2\theta_y)}$



$a^2 + b^2 = c^2$

$56^2 + b^2 = 65^2$

$b = \sqrt{65^2 - 56^2} = 33'$

$\cos\theta_y = \frac{56}{65}$

$F_y = 3900\,\frac{56}{65}$

$F_h = 3900\,\frac{33}{65}$

Fig. P2.77 and P2.78

2.84 A force acts at the origin of a coordinate system in a direction defined by the angles $\theta_y = 120°$ and $\theta_z = 75°$. Knowing that the x component of the force is +40 N, determine (*a*) the angle θ_x, (*b*) the magnitude of the force.

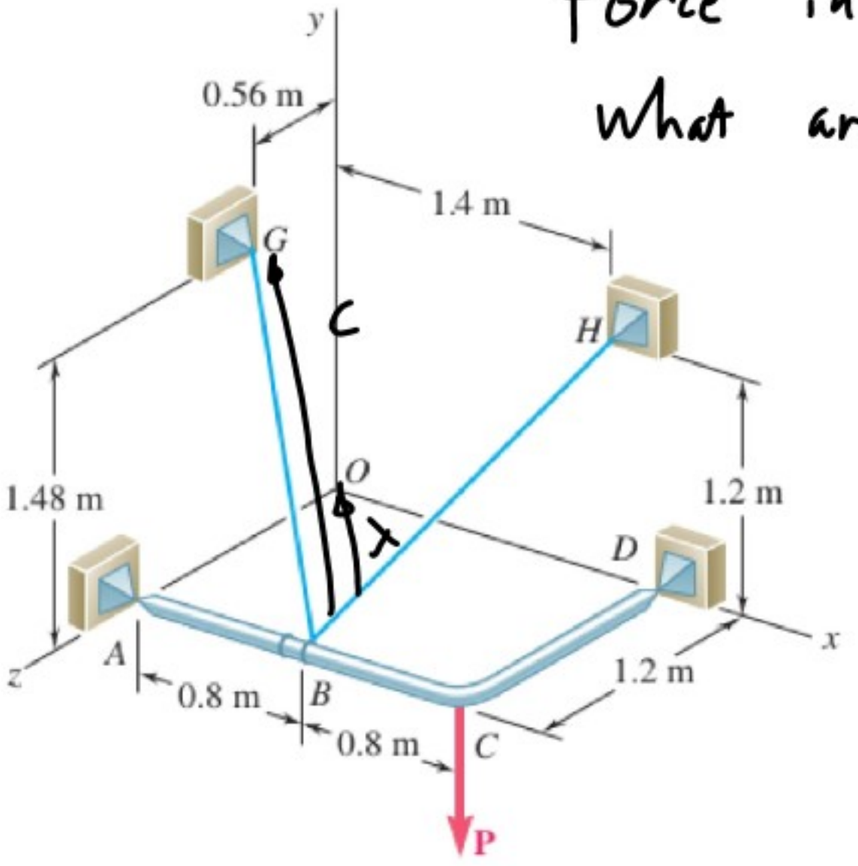
2.85

$\vec{\lambda} = 0.39\mathbf{i} + 0.32\mathbf{j} - 0.86\mathbf{k}$

$\sqrt{0.39^2 + 0.32^2 + 0.86^2} = 1$

$\vec{F} = 590\vec{\lambda}$

$= -237\mathbf{i} + 443\mathbf{j} - 194\mathbf{k}$



Force in BG is 590 N

What are its components at B?

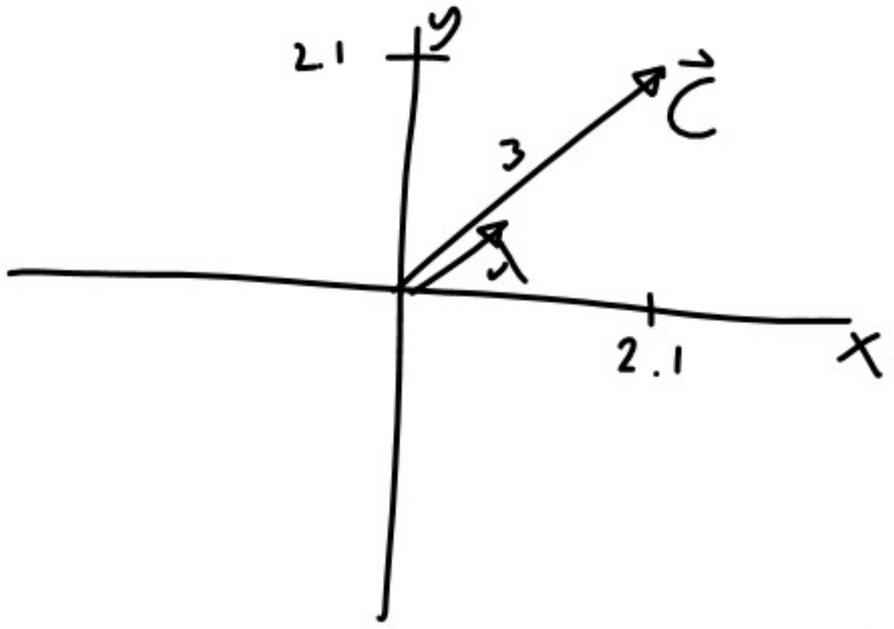
$\langle C_x, C_y, C_z \rangle$

$\vec{C} = \langle -0.8, 1.48, -1.2 + 0.56 \rangle$

$= \langle -0.8, 1.48, -0.64 \rangle$ m

$C = \sqrt{0.8^2 + 1.48^2 + 0.64^2} = 1.8$ m

$\vec{\lambda} = \frac{-0.8}{1.8}\mathbf{i} + \frac{1.48}{1.8}\mathbf{j} + \frac{-0.64}{1.8}\mathbf{k}$



$C = 3$

$\vec{C} = 2.1\,i + 2.1\,j$

$\vec{\lambda} = \frac{2.1}{3}\,i + \frac{2.1}{3}$

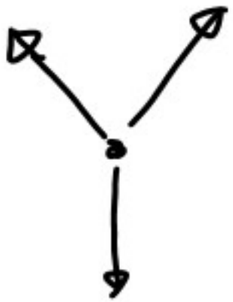
$= 0.7i + 0.7j$

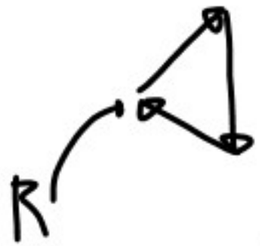
$\vec{Q} = \langle 3, 6, 10, 11, 2, 4, 6 \rangle$ $\quad Q = \sqrt{\sum^{i} Q_i^2}$

$\frac{\vec{Q}}{Q} = \vec{\lambda}$

Equilibrium

$$\Sigma \vec{F} = 0$$





$\Sigma F = R$

$R = 0$

2.F3 The 60-lb collar A can slide on a frictionless vertical rod and is connected as shown to a 65-lb counterweight C. Draw the free-body diagram needed to determine the value of h for which the system is in equilibrium.

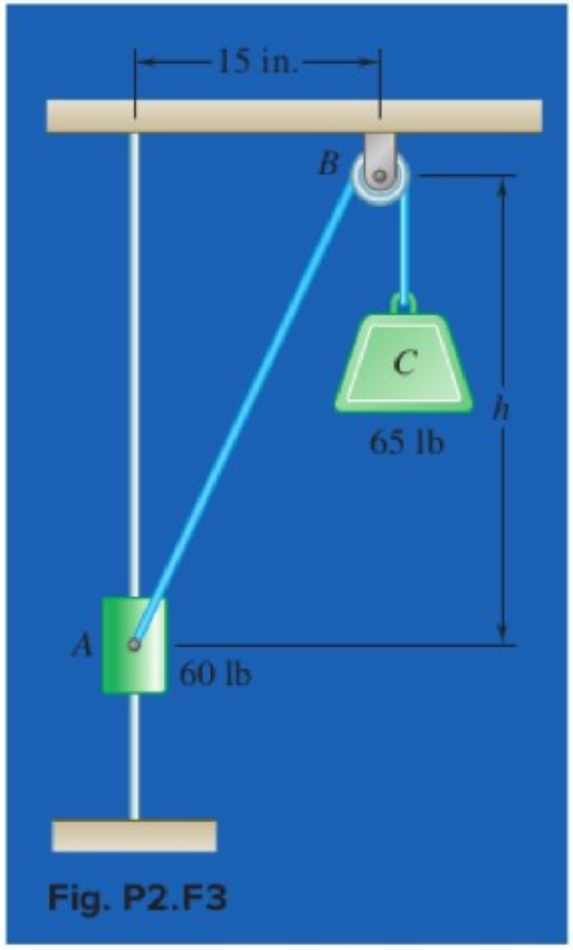
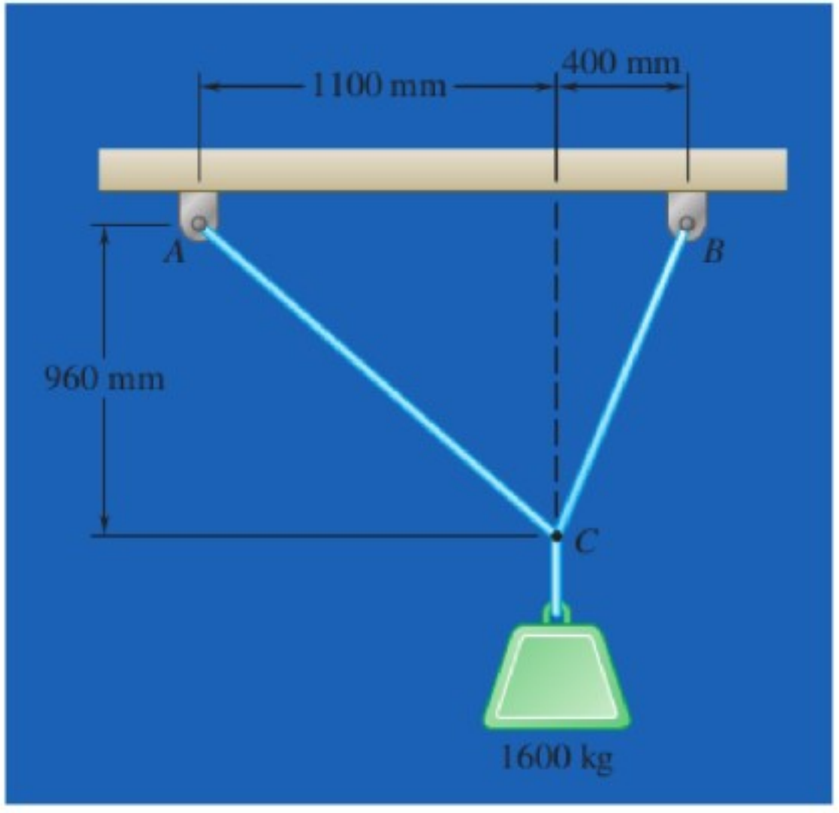


Fig. P2.F3

2.F1 Two cables are tied together at C and loaded as shown. Draw the free-body diagram needed to determine the tension in AC and BC.



2.48 Knowing that $\alpha = 20°$, determine the tension (*a*) in cable *AC*, (*b*) in rope *BC*.

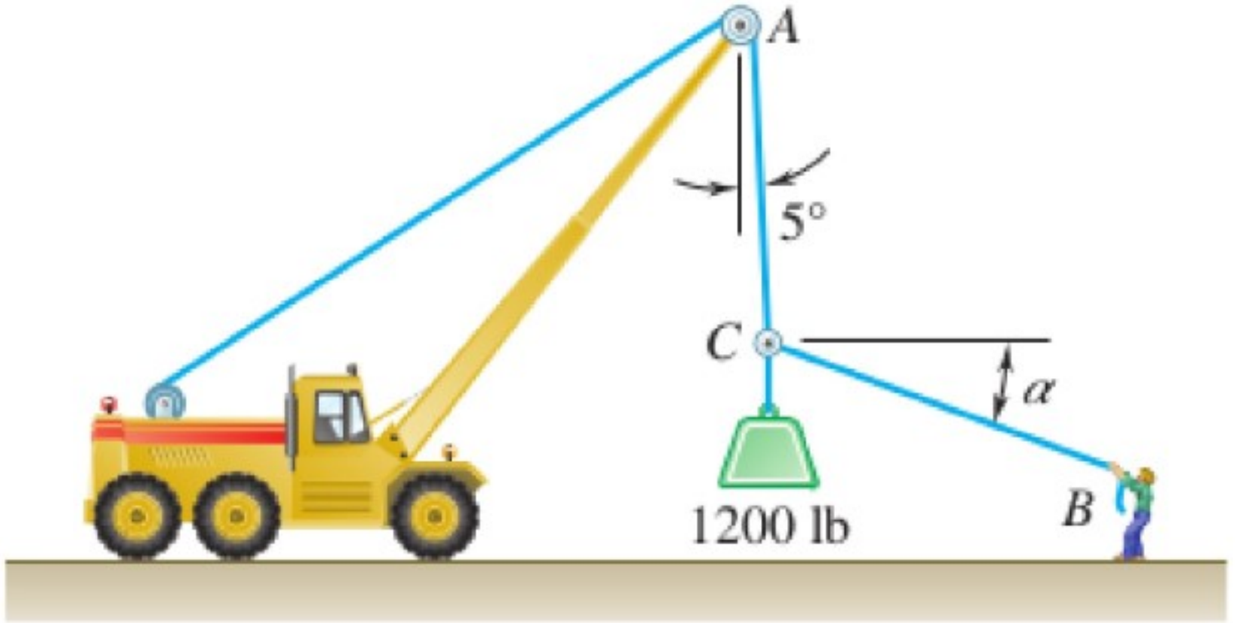


Fig. P2.48