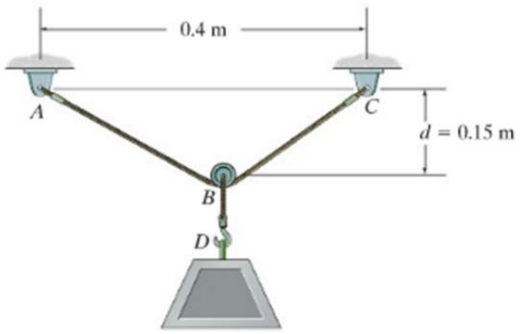
F3–3. If the 5-kg block is suspended from the pulley B and the sag of the cord is $d = 0.15$ m, determine the force in cord ABC. Neglect the size of the pulley.



$$\pm \Sigma F_x = 0; \quad T\cos\theta - T\cos\phi = 0$$

$$\phi = \theta$$

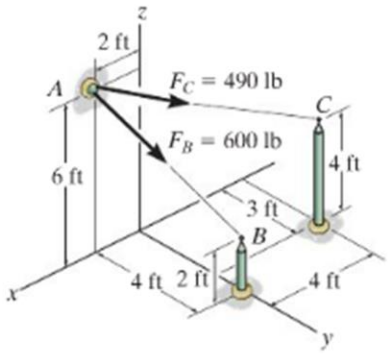
$$+\uparrow \Sigma F_y = 0; \quad 2T\sin\theta - 49.05\ \text{N} = 0$$

$$\theta = \tan^{-1}\left(\frac{0.15\ \text{m}}{0.2\ \text{m}}\right) = 36.87°$$

$$T = 40.9\ \text{N}$$

Sum forces in X and Y. Tension on each side of the pulley is equal (T)

F2–24. Determine the resultant force at A.



2-24

$\vec{F}_B = F_B \vec{u}_B$

$= 600\,\text{lb}\left(-\frac{1}{3}\hat{i} + \frac{2}{3}\hat{j} - \frac{2}{3}\hat{k}\right) = -200\hat{i} + 400\hat{j} - 400\hat{k}$

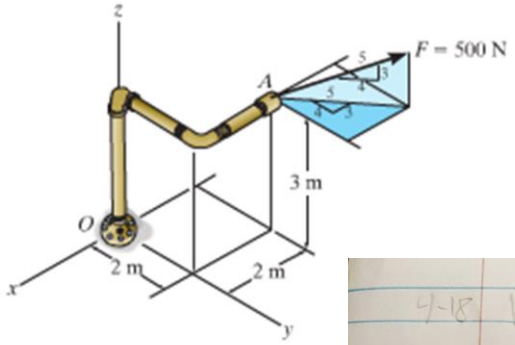
$\vec{F}_C = F_C \vec{u}_C$

$= -420\hat{i} + 210\hat{j} - 140\hat{k}$

$\vec{F}_R = \vec{F}_B + \vec{F}_C$

$= \boxed{-620\hat{i} + 610\hat{j} - 540\hat{k}\ \text{lb}}$

F4–18. Determine the moment of force **F** about the x, the y, and the z axes. Solve the problem using both a scalar and a vector analysis.



4-18 Scalar: [F']

$F_x = \left(\frac{3}{5}\right)\left[\frac{4}{5}(500)\right] = 240\ \text{N}$

$F_y = \frac{4}{5}\left[\frac{4}{5}(500)\right] = 320\ \text{N}$

$F_z = \frac{3}{5}(500) = 300$

$M_x = -320(3) + 300(2) = \boxed{-360\ \text{N·m}}$

$M_y = -240(3) - 300(-2) = \boxed{-120\ \text{N·m}}$

$M_z = 240(2) - 320(2) = \boxed{-160\ \text{N·m}}$

4-18 Vector: $F = (-240\hat{i} + 320\hat{j} + 300\hat{k})\ \text{N}$

$r_{OA} = -2\hat{i} + 2\hat{j} + 3\hat{k}$

$M_x = \hat{i}\cdot(\vec{r}_{OA}\times\vec{F}) = \boxed{-360\ \text{N·m}}$

$M_y = \hat{j}\cdot(\vec{r}_{OA}\times\vec{F}) = \boxed{-120\ \text{N·m}}$

$M_z = \hat{k}\cdot(\vec{r}_{OA}\times\vec{F}) = \boxed{-160\ \text{N·m}}$

$\vec{M}_o = r_{OA}\times F =$

$\hat{i}$	$\hat{j}$	$\hat{k}$	$\hat{i}$	$\hat{j}$
-2	2	3	-2	2
-240	320	300	-240	320

$= -360\hat{i} - 120\hat{j} - 160\hat{k}$

$M_x = \vec{M}_o\cdot\hat{i} = -360\ \text{N·m}$

$M_y = \vec{M}_o\cdot\hat{j} = -120\ \text{N·m}$

$M_z = \vec{M}_o\cdot\hat{k} = -160\ \text{N·m}$