QB1 - 3C - MCR

$$\vec{F}_R = \vec{F}_1 + \vec{F}_2 = \{-300\,\hat{i} + 150\,\hat{j} - 250\,\hat{k}\}\ N$$

$$\vec{M}_R = \vec{M}_O^{F_1} + \vec{M}_O^{F_2} = \vec{r}_{OB} \times \vec{F}_1 + \vec{r}_{OA} \times \vec{F}_2 = \{-650\,\hat{i} + 375\,\hat{k}\}\ N\cdot m$$

$$\vec{M}_O^{F_1} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1.5 & 2 & 1 \\ -300 & 150 & 200 \end{vmatrix} = \{250\,\hat{i} + 375\,\hat{k}\}\ N\cdot m$$

$$\vec{M}_O^{F_2} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 2 & 0 \\ 0 & 0 & -450 \end{vmatrix} = \{-900\,\hat{i}\}\ N\cdot m$$

QB1 - MCR - 3A

$$\stackrel{+}{\rightarrow} \Sigma F_x = F_{Rx} \rightarrow \quad F_{Rx} = 500\left(\tfrac{3}{5}\right) = 300\ N \qquad \Big| \qquad F_{Ry} = +\downarrow \Sigma F_y = -750 + 500\left(\tfrac{4}{5}\right) = -350\ N$$

$$\Sigma M_O = (M_R)_O \Rightarrow \quad (M_R)_O = -750\,(1.25) + 500\left(\tfrac{4}{5}\right)(2.5) - 500\left(\tfrac{3}{5}\right)(1) - 200(1)$$

$$\therefore\ (M_R)_O = -437.5\ N\cdot m = 437.5\ N\cdot m\ \circlearrowright$$

$$\therefore\ \vec{F}_R = \{300\,\hat{i} - 350\,\hat{j}\}\ N \quad \text{o} \quad F_R = 461\ N\ \angle\ 49.4^\circ$$

QB1 - MCR - 3B

$$F_{Rx} = \Sigma F_x \rightarrow F_{Rx} = -200 + 100\left(\tfrac{3}{5}\right) = -140\ lb$$

$$F_{Ry} = \Sigma F_y \rightarrow F_{Ry} = -150 + 100\left(\tfrac{4}{5}\right) = -70\ lb$$

$$\vec{F}_R = \{-140\,\hat{i} - 70\,\hat{j}\}\ lb.$$

$$F_R = 156.5\ lb\ \angle\ 26.56^\circ$$

$$(M_R)_A = \Sigma M_A = -150(3) + 100\left(\tfrac{4}{5}\right)(6) - 100\left(\tfrac{3}{5}\right)(4)$$

$$\therefore\ (M_R)_A = -210\ lb\cdot ft = 210\ lb\cdot ft\ \circlearrowright$$