Calculate the vector moment $\mathbf{M}_A$ of the force $\mathbf{F}$. Determine the moment $M_{AB}$ of the force $\mathbf{F}$ about the axis $AB$.

\[
\mathbf{r}_{AC} = (2\ \text{ft}) \hat{k}
\]
\[
\mathbf{F} = (50\ \hat{i} - 40\ \hat{j} + 20\ \hat{k})\ \text{lb}
\]
\[
\mathbf{u}_{AB} = -0.8\ \hat{i} + 0.6\ \hat{j}
\]

\[
\mathbf{M}_A = \mathbf{r}_{AC} \times \mathbf{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & 2 \\ 50 & -40 & 20 \end{vmatrix}
\]

\[
\mathbf{M}_A = [(0)(20) - (2)(-40)]\ \hat{i} + [(2)(50) - (0)(20)]\ \hat{j} + (0)\ \hat{k}
\]

\[
\mathbf{M}_A = (80\ \hat{i} + 100\ \hat{j})\ \text{ft-lb}
\]

\[
M_{AB} = \mathbf{u}_{AB} \cdot \mathbf{M}_A = \mathbf{u}_{AB} \cdot (\mathbf{r}_{AC} \times \mathbf{F})
\]

\[
M_{AB} = \begin{vmatrix} u_x & u_y & u_z \\ r_x & r_y & r_z \\ F_x & F_y & F_z \end{vmatrix} = \begin{vmatrix} -0.8 & 0.6 & 0 \\ 0 & 0 & 2 \\ 50 & -40 & 20 \end{vmatrix}
\]

\[
M_{AB} = (-0.8)(0)(20) + (0.6)(2)(50) + (0)(0)(-40) - (0.6)(0)(20) - (-0.8)(2)(-40) - (0)(0)(50)
\]

\[
M_{AB} = 60 - 64 = -4\ \text{ft-lb}
\]

\[
M_{AB} = \mathbf{u}_{AB} \cdot \mathbf{M}_A = (-0.8\ \hat{i} + 0.6\ \hat{j}) \cdot (80\ \hat{i} + 100\ \hat{j})\ \text{ft-lb}
\]

\[
M_{AB} = (-0.8)(80) + (0.6)(100) = -4\ \text{ft-lb}
\]