F 4-11

$$r_{BC} = 4i - 4j - 2K$$

$$|r_{BC}| = \sqrt{4^2 + (-4)^2 + (-2)^2} = 6$$

$$u_{BC} = \frac{1}{6}(4i - 4j - 2K)$$

$$= \frac{2}{3}i - \frac{2}{3}j - \frac{1}{3}K$$

$$F_{BC} = F \cdot u_{BC} = 120\left(\frac{2}{3}i - \frac{2}{3}j - \frac{1}{3}K\right)$$

$$= (80i - 80j - 40K)\ lb$$

$$r_{OB} = i + 4j + 2K$$

$$M_O = F_{BC} \times r_{OB} = \begin{vmatrix} i & j & K \\ 80 & -80 & -40 \\ 1 & 4 & 2 \end{vmatrix}$$

$$= [-80(2) - (-40)(4)]i - [80(2) - (-40)(1)]j + [80(4) - (-80)(1)]K$$

$$= (200j + 400K)\ lb\text{-}ft$$

We could have used dot product to find angle between F_{BC} and r_{OB}, then used cross product $|A||B|\sin\theta$. This would give us magnitude of the moment, and not the vector.