

6-3.8

Given  $\vec{A} = \vec{i} + 2\vec{j} + 3\vec{k}$   
 $\vec{B} = 3\vec{i} + 2\vec{j} + \vec{k}$

Torque about origin is  $\vec{\tau} = \vec{A} \times \vec{B}$

$$\vec{\tau} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 3 & 2 & 1 \\ 1 & 2 & 3 \end{vmatrix} = (2 \cdot 3 - 1 \cdot 2)\vec{i} - (3 \cdot 3 - 1 \cdot 1)\vec{j} + (3 \cdot 2 - 2 \cdot 1)\vec{k}$$

$$\vec{\tau} = (6 - 2)\vec{i} - (9 - 1)\vec{j} + (6 - 2)\vec{k}$$

$$\vec{\tau} = 4\vec{i} - 8\vec{j} + 4\vec{k}$$

Find torque vector about x-axis :

$$|\tau_x| = \tau_x = \vec{\tau} \cdot \vec{i} = (4\vec{i} - 8\vec{j} + 4\vec{k}) \cdot \vec{i} = 4$$

$$\tau_x = 4\vec{i}$$

$$\text{Hence } \tau_y = -8\vec{j} \quad \& \quad \tau_z = 4\vec{k}$$