25. (a) We use $\vec{\ell} = m\vec{r} \times \vec{v}$, where $\vec{r}$ is the position vector of the object, $\vec{v}$ is its velocity vector, and m is its mass. Only the x and z components of the position and velocity vectors are nonzero, so Eq. 3-30 leads to $\vec{r} \times \vec{v} = (-xv_z + zv_x)\,\hat{\mathrm{j}}$. Therefore,

$$\begin{aligned}\vec{\ell} &= m\,(-xv_z + zv_x)\,\hat{\mathrm{j}} \\ &= (0.25\,\mathrm{kg})\,(-(2.0\,\mathrm{m})(5.0\,\mathrm{m/s}) + (-2.0\,\mathrm{m})(-5.0\,\mathrm{m/s}))\,\hat{\mathrm{j}} \\ &= 0\;.\end{aligned}$$

(b) If we write $\vec{r} = x\hat{\mathrm{i}} + y\hat{\mathrm{j}} + z\hat{\mathrm{k}}$, then (using Eq. 3-30) we find $\vec{r} \times \vec{F}$ is equal to

$$(yF_z - zF_y)\,\hat{\mathrm{i}} + (zF_x - xF_z)\,\hat{\mathrm{j}} + (xF_y - yF_x)\,\hat{\mathrm{k}}\;.$$

With $x = 2.0$, $z = -2.0$, $F_y = 4.0$ and all other components zero (and SI units understood) the expression above yields $\vec{\tau} = \vec{r} \times \vec{F} = \left(8.0\,\hat{\mathrm{i}} + 8.0\,\hat{\mathrm{k}}\right)\ \mathrm{N{\cdot}m}$.