17. One method is to show that $\vec{r} \cdot \left(\vec{r} \times \vec{F}\right) = \vec{F} \cdot \left(\vec{r} \times \vec{F}\right) = 0$, but we choose here a more pedestrian approach: without loss of generality we take $\vec{r}$ and $\vec{F}$ to be in the xy plane – and will show that $\vec{\tau}$ has no x and y components (that it is parallel to the $\hat{\mathrm{k}}$ direction). We proceed as follows: in the general expression $\vec{r} = x\hat{\mathrm{i}} + y\hat{\mathrm{j}} + z\hat{\mathrm{k}}$, we will set $z = 0$ to constrain $\vec{r}$ to the xy plane, and similarly for $\vec{F}$. Using Eq. 3-30, we find $\vec{r} \times \vec{F}$ is equal to

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

and once we set $z = 0$ and $F_z = 0$ we obtain

$$\vec{\tau} = \vec{r} \times \vec{F} = (xF_y - yF_x)\,\hat{\mathrm{k}}$$

which demonstrates that $\vec{\tau}$ has no component in the xy plane.