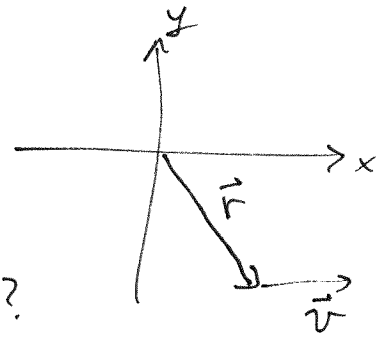


Chapter 11Problem 37

$$m = 5.0 \text{ kg}$$

$$\vec{F} = (2.0 \hat{i} - 3.0 \hat{j}) \text{ m}$$

$$\vec{v} = (3.0 \hat{i}) \text{ m/s}$$



a) What is the angular momentum?

$$\vec{L} = \vec{r} \times \vec{p} = \vec{r} \times (m\vec{v}) = m(\vec{r} \times \vec{v})$$

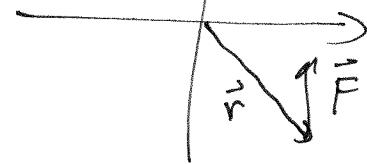
$$\vec{r} \times \vec{v} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -3 & 0 \\ 3 & 0 & 0 \end{vmatrix} \frac{\text{m}^2}{\text{s}} = \hat{i}(0(-3) - 0(0)) - \hat{j}(2(0) - 3(0)) + \hat{k}(2(0) - 3(-3))$$

$$= 9.0 \hat{k} \frac{\text{m}^2}{\text{s}}$$

$$\therefore \vec{L} = (5.0 \text{ kg}) (9.0 \hat{k} \frac{\text{m}^2}{\text{s}}) = \boxed{45 \hat{k} \frac{\text{kgm}^2}{\text{s}}}$$

b) What is the torque on the particle?

$$\vec{F} = 5.0 \hat{j} \text{ N}$$



$$\vec{\tau} = \vec{r} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -3 & 0 \\ 0 & 5 & 0 \end{vmatrix} \text{ N}\cdot\text{m}$$

$$= \hat{i}[-3(0) - 5(0)] - \hat{j}[2(0) - 0(0)] + \hat{k}[2(5) - 0(-3)]$$

$$\vec{\tau} = \boxed{10 \hat{k} \text{ N}\cdot\text{m}}$$