Ch. 11 Prob. 80

$\vec{\ell} = 1.0\,m\,\hat{i}$

$I = 2.0\,A$ in +x-direction

$\vec{B} = (3.0\hat{i} + 4.0\hat{k}) \times 10^{-3}\,T$

Find the magnetic force on the wire segment

$$\vec{F} = I\vec{\ell} \times \vec{B} = (2.0A)\left[(1.0m\,\hat{i}) \times (3.0\,\hat{i} + 4.0\hat{k}) \times 10^{-3}\,T\right]$$

$$= 2.0A\left[\left(3.0(\hat{i}\times\hat{i}) + 4.0(\hat{i}\times\hat{k})\right) \times 10^{-3}\,T\cdot m\right]$$

$$= 2.0A\left[\left(0 + 4.0(-\hat{j})\right) \times 10^{-3}\,T\cdot m\right]$$

$$= -8.0 \times 10^{-3}\,\hat{j}\,T\cdot m\cdot A$$

$$\boxed{\vec{F} = -8.0 \times 10^{-3}\,\hat{j}\;N}$$