

78. We use $d\vec{F}_B = i d\vec{L} \times \vec{B}$, where $d\vec{L} = dx \hat{i}$ and $\vec{B} = B_x \hat{i} + B_y \hat{j}$. Thus,

$$\begin{aligned}
 \vec{F}_B &= \int i d\vec{L} \times \vec{B} \\
 &= \int_{x_i}^{x_f} i dx \hat{i} \times (B_x \hat{i} + B_y \hat{j}) = i \int_{x_i}^{x_f} B_y dx \hat{k} \\
 &= (-5.0 \text{ A}) \left(\int_{1.0}^{3.0} (8.0x^2 dx) (\text{m} \cdot \text{T}) \right) \hat{k} \\
 &= -0.35 \text{ N } \hat{k} .
 \end{aligned}$$