5. We assume the current flows in the $+x$ direction and the particle is at some distance d in the $+y$ direction (away from the wire). Then, the magnetic field at the location of the charge q is

$$\vec{B} = \frac{\mu_0 i}{2\pi d}\,\hat{\mathrm{k}}\ .$$

Thus,

$$\vec{F} = q\vec{v} \times \vec{B} = \frac{\mu_0 i q}{2\pi d}\left(\vec{v} \times \hat{\mathrm{k}}\right)\ .$$

(a) In this situation, $\vec{v} = v(-\hat{\mathrm{j}})$ (where v is the speed and is a positive value). Also, the problem specifies $q > 0$. Thus,

$$\vec{F} = \frac{\mu_0 i q v}{2\pi d}\left((-\hat{\mathrm{j}}) \times \hat{\mathrm{k}}\right) = -\frac{\mu_0 i q v}{2\pi d}(\hat{\mathrm{i}})\ ,$$

which tells us that $\vec{F}_q$ has a magnitude of $\mu_0 i q v/2\pi d$ and is in the direction opposite to that of the current flow.

(b) Now the direction $\vec{v}$ is reversed, and we obtain $\vec{F} = +\mu_0 i q v \hat{\mathrm{i}}/2\pi d$. The magnitude is identical to that found in part (a), but the direction of the force is now in the same direction as that of the current flow.