Problem 1 A particle of charge $q$ enters a region of uniform magnetic field $\vec{B}$ pointing into the page, as shown in Figure 5.8 of the textbook. The field deflects the particle a distance $d$ above the original line of flight, as shown. Is the charge positive or negative? In terms of $a$, $d$, $B$, and $q$, what is the momentum of the particle just before it entered the field region?

Problem 2 Find the force on a square wire loop with side $a$, placed near an infinite straight wire as shown in Figure 5.24(a) in the textbook, but let the square loop carry a steady current $I_1$ and the straight wire carry a steady current $I_2$.

Problem 3 A wire loop consists of two quarter-circular segments and two straight radial segments. The radius of the larger quarter circle is $b$ and that of the smaller is $a$, as shown in Figure 5.23(a) of the textbook. The wire loop carries current $I$ as shown.
(a) Find the direction and magnitude of the magnetic field $\vec{B}$ at the point $P$.
(b) A point particle with positive charge $Q$ is moving through the point $P$ with velocity $v$ straight to the right (in the plane of the page). Find the force acting on the particle.