Chapter 29 Examples, B-Fields due to Currents

1) (a) Using the Biot-Savart Law, determine the magnetic field set up by a long, straight current carrying wire. Assume current *I* is carried by the wire and that the B-field strength under determination is a perpendicular distance *R* from the current carrying wire. (This will be done two ways.)
(b) Also determine the B-field strength for a semi-infinite straight wire carrying the same current.

2) Determine the magnetic field due to a current carrying circular arc of wire, at the center of the arc. Assume wire carries current *I*, has a radius, *R*, and the B-field may be a function of the angular spread of the arc, ϕ.

3) A long, straight coaxial cable with inner radius *a* and outer radius *b*, has uniform current density and carries current *i*. Use Ampere's Law to determine the magnetic field set up by such a wire at a radius *r* from the wire's center, in the following three regions:
   (a) for $a<r<b$
   (b) for $r>b$
   (c) for $r<a$
   (d) Now, the wire has non-uniform current density, $J=kR$ (where *k* is in A/m^3 and R is measured from the center of the wire, in the radial direction). Determine the B-field set up by such a wire for $r<a$.

4) Determine where the magnetic field is equal to ZERO for the two long, straight parallel wires carrying current in the directions shown. Assume the wires are 1 meter apart and that i1 is equal to ten times i2.