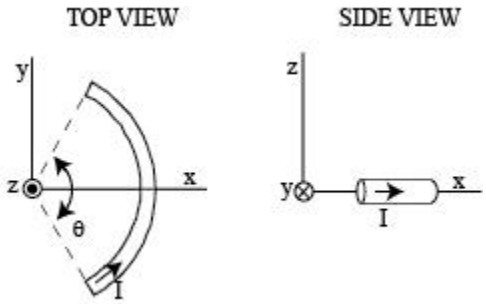
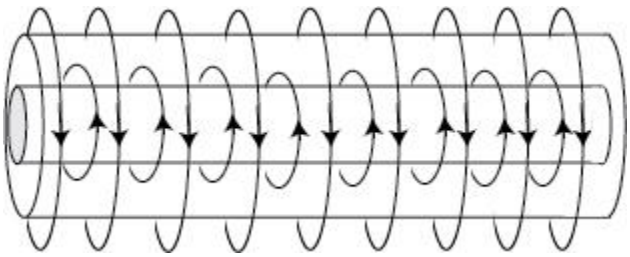
Homework 5.2:

1. Consider a current carrying circular arc that covers an angle of θ degrees and that is situated in the xy-plane. Furthermore assume that its center of curvature coincides with the origin (see the figure below).



   Consider an arbitrary field point on the z-axis at a distant z from the origin. Determine the component of the magnetic field parallel to the z-axis from Biot-Savart's law. Start of with making a drawing that shows the definition of all the parameters. Then determine expressions for r_script and dl', and finally evaluate the integral.

2. Work problem 5.8 a.
3. Work problem 5.9.
4. Work problem 5.10.
5. Two long coaxial solenoids each carry current I, but in opposite directions, as shown in the figure below. The inner solenoid (radius a) has n_1 turns per unit length, and the outer one (radius b) has n_2. Find B is each of the three regions: (1) inside the inner solenoid, (ii) between them, and (iii) and outside both.



6. A thick slab extending from z=-a to z=a (a>0) carries a uniform volume current

$$\vec{J} = J\hat{x}$$

   Find the magnetic field, as a function of z, both inside and outside the slab.

7. A large parallel-plate capacitor with uniform surface charge σ on the upper plate and $-\sigma$ on the lower is moving with a constant speed v, as shown in the figure below.

a. Find the magnetic field between the plates and also above and below them.
b. Find the magnetic force per unit area on the upper plate, including its direction.
c. At what speed v would the magnetic force balance the electric force.