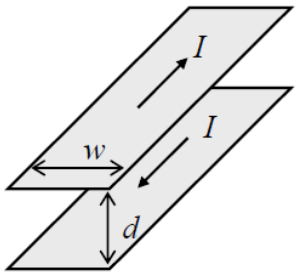
Problem 5.2. Two straight, plane, parallel, long, thin conducting strips of width w, separated by distance d, carry equal but oppositely directed currents I – see the figure on the right. Calculate the magnetic field in the plane located in the middle between the strips, assuming that the flowing currents are uniformly distributed across the strip widths.



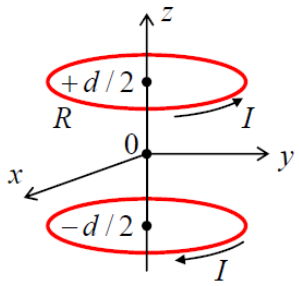
(30 pts)

Problem 5.3. For the system studied in the previous problem, but now only in the limit $d << w$, calculate:

(i) the distribution of the magnetic field in space,
(ii) the vector-potential of the field,
(iii) the magnetic force (per unit length) exerted on each strip, and
(iv) the magnetic energy and self-inductance of the loop formed by the strips (per unit length).

(30 pts)

Problem 5.4. Calculate the magnetic field distribution near the center of the system of two similar, plane, round, coaxial wire coils, carrying equal but oppositely directed currents – see the figure on the right.



(20 pts)

Problem 5.7. A thin round disk of radius R, carrying electric charge of a constant areal density σ, is being rotated around its axis with a constant angular velocity ω. Calculate:

(i) the induced magnetic field on the disk's axis,
(ii) the magnetic moment of the disk,

and relate these results.

(30 pts)