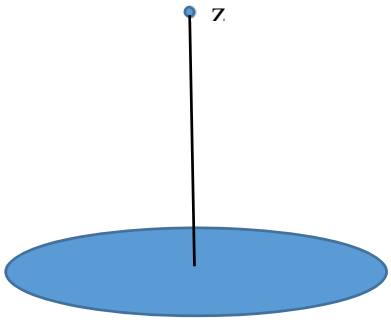
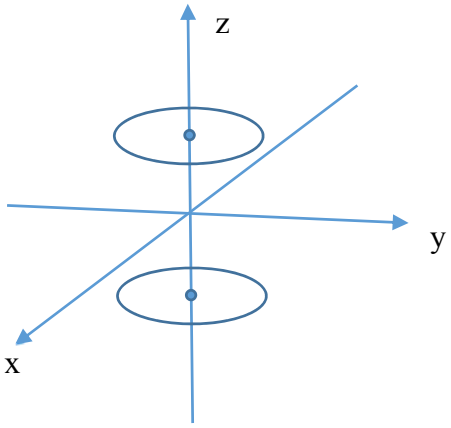
Electricity & Magnetism I, Homework #9
Fall 2016, (Due Wednesday, Nov. 23, 2016)

1. A disk of radius a carrying a uniform surface charge density σ spins on its axis with an angular velocity ω. Find the magnetic field B at a point z above the center of the disk as shown below.



2. Helmholtz coils. Two circular coils of radius R, each carrying current I in the same direction are parallel with xy plane with their center at (0,0, ±s/2).



(a) On the z-axis, the magnetic field is a function of z, $\vec{B} = B(z)\hat{k}$. Show that at z = 0, the first derivative of the field is equal to zero.
(b) Find the value of s, such that the second derivative of the B field with respect to z is also zero at z = 0.

3. A long copper rod carries a current density of Jo in the z-direction. The cross-section of the rod is shown below. The radius of the rod is R and there is a small circular cavity runs along the z-axis with its center at (a,0), the radius of the cavity is b. Find the magnetic field at the center of the cavity (a, 0).