

Physics 322 Homework Set #3 Winter 2009

Due in class, Friday 1/30

1. Problem 5.19, parts a,b,c in your textbook.
2. In a region of space, a current density, \vec{J} produces a cylindrically symmetric magnetic field $\vec{B} = (k/s)\hat{z}$ where k is a constant and s is the radial coordinate. Find \vec{J} and the vector potential, \vec{A} , in this region of space.
3. Problem 5.24 in your textbook.
4. A thin disk of radius a and thickness t ($t \ll a$) has a uniform volume charge density, ρ . The disk rotates about its axis at a constant angular rate, ω . What is the magnetic dipole moment of the disk?
5. Problem 5.37 in your textbook.
6. We create a total magnetic field $\vec{B}_T = \vec{B}_1 + \vec{B}_2$ where $\vec{B}_1 = -B_0\hat{z}$ is a uniform field pointing in the $-\hat{z}$ direction and \vec{B}_2 is the field from a magnetic dipole $\vec{m} = m_0\hat{z}$ located at the origin. Show that there is a spherical surface, centered on the origin, through which no magnetic field lines pass (ie $\vec{B}_T(R) \cdot \hat{r} = 0$) and find the radius, R , of this sphere.