

Physics 322 Homework Set #4 Winter 2009

Due in class Friday 2/6/09

1. Problem 6.1 in your textbook.
2. a.) A magnetic dipole, $\vec{m}_1 = m_1 \hat{z}$, is located at the origin and a second dipole, $\vec{m}_2 = m_2 \hat{z}$, is at point z on the \hat{z} axis. Calculate the force that \vec{m}_1 exerts on \vec{m}_2 .
b.) Same question as above, except $\vec{m}_2 = m_2 \hat{x}$ (still at point z).
3. An infinite cylinder of radius R has a magnetization, $\vec{M} = ks^2 \hat{\phi}$. (k is a constant, s is the radial coordinate from the cylinder axis, and $\hat{\phi}$ the azimuthal unit vector.) Find the magnetic field produced by \vec{M} both inside and outside of the cylinder.
4. A thin flat ring with outer radius R_2 , inner radius R_1 , and thickness t is centered on the origin and has its symmetry axis along \hat{z} . The disk has a uniform magnetization $\vec{M} = M_0 \hat{z}$. Find the magnetic field at the origin (center of the ring).
5. Problem 6.10 in your textbook.