**Quiz 4** Name:_____

Physics 438: Introduction to Electrodynamics April 27, 2011

*Complete this quiz showing all work on attached paper.*

1. Let $\vec{A} = k\, s\hat{\phi}$ for $0 < s < a$ and zero for $s > a$ in polar coordinates $(s, \phi, z)$. Compute the magnetic field due to this vector potential.

2. The interior of a solenoid is filled completely with a material with magnetic susceptibility $\chi_m = 2.4$. The solenoid has 120 turns per meter and a current of $i = 0.056$ A. Compute $\vec{H}$, $\vec{M}$, and $\vec{B}$ inside the solenoid.

3. An infinitely long cylinder of radius $R$ carries a uniform magnetization $\vec{M}$ parallel to its axis.

   (a) Compute the bound surface current density and bound current density.

   (b) Using Ampere's law for $\vec{B}$, determine the magnetic field inside and outside the cylinder.