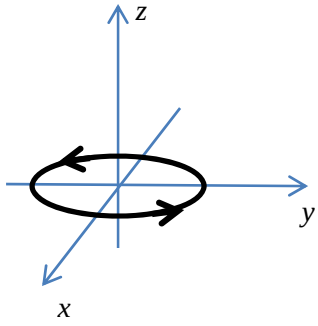
Lesson #36: Magnetic Dipoles; Magnetization Name: _____

Review section 5.4 as necessary, and study section 6.1. Then answer the following questions.

1. A current loop (radius R) carries a current I and is centered on the origin in the x-y plane.



   a. What is the dipole moment (magnitude and direction) of this current distribution?

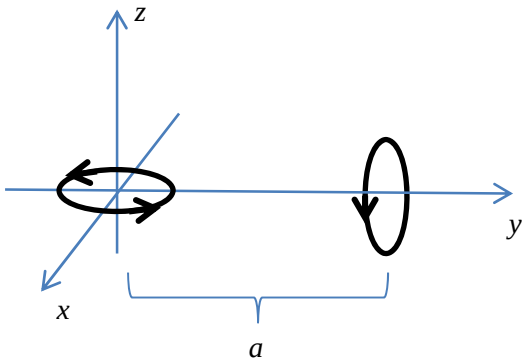
   b. What is the magnitude and direction of the magnetic dipole field produced at the following locations in the y-z plane? Note these locations are the same distance from the origin. *(Hint: see Eq. 5.86)*

   $(0,0,a)$ magnitude = direction =

   $\left(0,\frac{a}{\sqrt{2}},\frac{a}{\sqrt{2}}\right)$ magnitude = direction =

   $(0,a,0)$ magnitude = direction =

2. Suppose a second, identical current loop is placed at (0, a, 0) but oriented 90° to the first, as shown (its moment points to the right). Assuming both loops can be approximated as "ideal" dipoles, what is the torque exerted on the new loop by the original one?



3. What is meant by the term "paramagnetism," and what is the microscopic mechanism that creates it inside a paramagnetic material?

4. What is meant by the term "diamagnetism," and what is the microscopic mechanism that creates it inside a diamagnetic material?