Lesson #38: Bound Currents / Auxiliary Field **Name:** _____

Study sections 6.2-6.3 and example 6.2. Then answer the following questions.

1. On pp. 267-268 of the class text, the author shows that a non-uniform magnetization leads to a bound current density given by $\vec{J}_b = \vec{\nabla} \times \vec{M}$. The first few mathematical steps are shown below. In the space provided, explain clearly in words where each step comes from or supply the missing steps.

$$I_x = \left[M_z(y + dy) - M_z(y)\right]dz$$

$$I_x = \frac{\partial M_z}{\partial y} dy\, dz$$

$$\left(J_b\right)_x = \frac{\partial M_z}{\partial y}$$

2. Explain in words what is meant by the "auxiliary" field **H** and how it is useful in magnetism.

3. In example 6.2, how do we know that the magnetization is directed antiparallel to the magnetic field?

4. In example 6.2, how do we know that the bound volume current $\mathbf{J_b}$ is directed antiparallel to the free current?