

Homework Assignment #33

(due Dec. 2, 2022, at the beginning of class)

1. Griffiths 7.13

2. Griffiths 7.17

Hint: for (b) use that

$$I_{\text{induced}} = \frac{\epsilon}{R} = -\frac{1}{R} \frac{d\Phi}{dt}$$

and it follows here that

$$\Delta Q = -\frac{\Delta\Phi}{R}$$

3. Griffiths 7.22 (optional; will not be graded)

Hints:

- For (a) use Eq. (5.41).
- For (b) use Eq. (5.88) and to get the flux use that $\int \vec{B} \cdot d\vec{a}$ depends only on the boundary of the surface but not on the shape of the surface. The \vec{B} -field of a magnetic moment in the origin $\vec{m} = m\hat{z}$ is given by Eq. (5.88), i.e. has spherical symmetry. To simplify $\vec{B} \cdot d\vec{a}$ choose therefore not a flat surface, but instead choose as surface a spherical cap centered around \vec{m} , that is a sphere with center where the small loop of radius a is, that is at \vec{m} , and choose as surface not the complete spherical surface but the boundary being the loop of radius b (see sketch at beginning of lecture on Nov. 30).

4. Griffiths 7.24