

Mathematical Physics — PHZ 3113

Curl Homework (January 30, 2013)

Use the identity (with Einstein convention)

$$\epsilon_{ijk}\epsilon_{klm} = \delta_{il}\delta_{jm} - \delta_{im}\delta_{jl} \quad (1)$$

to solve the following assignments.

1. Show (Book (1.89) p.51)

$$\vec{B} \times (\nabla \times \vec{A}) + \vec{A} \times (\nabla \times \vec{B}) = \nabla (\vec{A} \cdot \vec{B}) - (\vec{B} \cdot \nabla) \vec{A} - (\vec{A} \cdot \nabla) \vec{B} \quad (2)$$

2. The vector potential \vec{A} of a magnetic dipole moment \vec{m} is given by (Book 1.7.11 p.52)

$$\vec{A} = \left(\frac{\mu_0}{4\pi}\right) \left(\frac{\vec{m} \times \vec{r}}{r^3}\right) \cdot$$

Calculate the magnetic field $\vec{B} = \nabla \times \vec{A}$.