

# Assignment 6

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(due date: November 5, 2018)

## 1 Angular Momentum [30 pt]

Show that the spherical harmonics are eigenfunctions of  $L^2$  and  $L_z$ . To be specific, derive Eq. [4.132] from Eq. [4.123]. If you want to use an alternative way instead of Griffiths', any methods are welcome.

## 2 Energy of a magnetic dipole [20 pt]

Consider a magnetic dipole  $m$  being in a magnetic field  $B$ . Show that the energy of a magnetic dipole in the field is given by

$$U = -m \cdot B. \quad (1)$$

Also, show that the force to this dipole is

$$F = -\nabla(-m \cdot B). \quad (2)$$

See Chap. 6 of Introduction to Electrodynamics, D. J. Griffiths.