PH403: Quantum Mechanics I
Tutorial Sheet 8

Problems in this tutorial sheet deal with some simple problems related to theory of angular momentum in quantum mechanics.

1. Prove that
$$[\mathbf{L}_i, \mathbf{L}_j] = i\hbar\epsilon_{ijk}\mathbf{L}_k,$$
where $\mathbf{L}_i$ represents the $i-$th component of the orbital angular momentum operator $\mathbf{L} = \mathbf{R} \times \mathbf{P}$.

2. Prove that $[\mathbf{L}^2, \mathbf{L}] = 0$.

3. Show that in the $|\mathbf{r}\rangle$-representation and in terms of spherical polar coordinates
$$L_z = i\hbar\frac{\partial}{\partial\phi}$$