Tutorial 5

1. Consider a particle in a three dimensional $a \times a \times 2a$ box.

a. Write out an expression for the energy eigenfunctions, $\psi(x,y,z)$, of this particle, and the associated energy eigenvalue - in terms of the appropriate quantum numbers.

b. How many states are there with energy, $E < 10h^2/(8ma^2)$?

c. How many energy levels are there with, $E < 10h^2/(8ma^2)$, and what are their degeneracies?

2. Recall that

$$\left[\hat{L}_x, \hat{L}_z\right] = -i\hbar\hat{L}_y$$

$$\left[\hat{L}_y, \hat{L}_z\right] = i\hbar\hat{L}_x$$

Show that

$$\left[\hat{L}_x^2 + \hat{L}_y^2, \hat{L}_z\right] = 0.$$