Birzeit University
Faculty of Science-Department of Physics
Quantum Mechanics I, Phys433
Fall 2020
HW5

1. Solve 3D-Harmonic oscillator once in cartesian coordinates and once in spherical coordinates. Compare your answers

2. Show that for orbital angular momentum $\hat{L}$

$$\Delta \hat{L}_x \Delta \hat{L}_y = \hbar^2 [L(L+1) - m_L^2]$$

3. Consider an electron in the Hydrogen-atom. The wavefunction of the electron is, at time t =0, written as:

$$\Psi(r, t = 0) = A(\psi_{211} + 2\psi_{300} + \psi_{421})$$

   (a) Find the normalization constant A
   (b) Write the wavefunction at any later time t
   (c) What is the expectation value of L_z
   (d) What is the expectation value of L^2
   (e) What is the expectation value of H

4. Calculate $< z\hat{H}z >$, in the ground state of hydrogen. Hint:If your solution take more than 10 lines then re-think the problem