

**PHYSICS 505 – 1<sup>st</sup> Semester 2017-2018**  
**1<sup>st</sup> HOMEWORK**  
**Dr. V. Lempesis**

**Hand in: Monday 16<sup>th</sup> October 2017 at 23:59.**

1. The electron in the hydrogen atom is in the ground state. Calculate the probability to find it at distances smaller or equal to two Bohr radii.
2. Prove the relation:  $l_- |lm\rangle = \hbar \sqrt{l(l+1) - m(m-1)} |l, m-1\rangle$ .
3. Prove the relation  $l_+ l_- = l^2 - l_z(l_z - \hbar)$ .
4. Prove the relation  $\langle l_y \rangle = 0$ .

You have to send your answers in pdf form (typed or in clearly handwritten form) in my email address ([vlmpesis@ksu.edu.sa](mailto:vlmpesis@ksu.edu.sa)) before the deadline. Do not forget to put your name (in English) and your ID number on it and on the name of the file for example: Homework 1 – Vasileios Lempesis 345678965.pdf