

Problems:

1- Drive L_x , L_y , L_z and L^2 , in spherical coordinate.

2-Prove the following commutation relations:

$$[x, p_x] = i\hbar$$

$$[x, p_y] = 0$$

$$[L_x, L_y] = i\hbar L_z$$

$$[L_y, L_z] = i\hbar L_x$$

$$[L_z, L_x] = i\hbar L_y$$

$$[L^2, L_z] = 0$$

3- For the following wave function

$$\psi(\phi) = Ae^{im\phi}$$

a) determine the normalization constant A,

b) Show that the functions are also eigen functions of the angular momentum operator L_z .