CH107 Home Assignment Week-3

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14$^{\text{th}}$ January 2023

This week, we finished solving the Schrodinger Equation for the Hydrogen Atom.
We finally got our wavefunction as a product of Radial and Spherical Harmonics.
Also, we know the following about our Quantum Numbers:

- Magnetic Quantum Number (m$_l$) corresponds to the z-component (orientation/direction) of Orbital Angular Momentum

- Azimuthal Quantum Number (l) specifies the magnitude of the electron's orbital angular momentum.

- Principal Quantum Number (n) specifies the energy of the electron.

On writing the complete wavefunction for different orbitals, for m $\neq$ 0, we get Ψ to be complex due to $\Phi(\varphi)$. Therefore, to get Real Wavefunctions we did a Linear Combination of the Complex wavefunctions (+m and -m).
We then went through the surface plots for the Wavefunctions/Orbitals and then proceeded to the Radial Probability Distribution Function to be able to determine the Probability of finding the electron anywhere in our plot. We noted that the number of radial nodes is always n-l-1 and angular nodes are l.
We also observed that orbital pictures are misinterpreted by many people which is quite unfortunate.
The truth is **ORBITAL is a 1-electron wavefunction ONLY!!!**
We moved forward to plotting (Angular*Radial)^2 Electron Density and their Contours. Then we plotted probability density contours for 2p$_z$ and d, f orbitals with emphasis on z-axis-symmetric (no φ component) orbitals.
We also went through a brief overview of nodal planes.