Theory of the Hydrogen Atom

Derived from first principles the wave equation of an electron in the hydrogen atom.

- Start with Dirac Notation
- Replace with known general functions
- transform to eigenvalue equation in position space
- replace pieces with function F and find derivatives
  $F = \sum C_k \rho^k$

pic 3 first take had factors that needed to be fixed

- Led to the Laguerre Polynomials
  These are infinite, though, so
- Force Laguerre Polynomial solutions to truncate

Derivation

The differential equation is separable.

$\langle r,\theta,\varphi | \Psi \rangle = R(r)_{e,l}\ y_{l,m}(\theta,\varphi)$

$R_{e,l}(r) = U_{e,l}(r)\ /r$