1. In a double-slit experiment with a source of monoenergetic electrons, detectors are placed along a vertical screen parallel to the \( y \) axis to monitor the diffraction pattern of the electrons emitted from the two slits. When only one slit is open, the amplitude of the electrons detected on the screen is \( \psi_1(y,t) = A_1e^{-i(ky-wt)}/\sqrt{1+y^2} \), and when only the other is open the amplitude is \( \psi_2(y,t) = A_2e^{-i(ky+\pi y-wt)}/\sqrt{1+y^2} \), where \( A_1 \) and \( A_2 \) are normalization constants that need to be found. Calculate the intensity detected on the screen when

(a) both slits are open and a light source is used to determine which of the slits the electron went through.

(b) both slits are open and no light source is used.

Plot the intensity registered on the screen as a function of \( y \) for cases (a) and (b).

2. Use the uncertainty principle to estimate the ground state (a) radius and (b) energy of the hydrogen atom.