Chapter 10 Homework Assignment P-Chem Math

Do the following problems.

1. Show that the integral \( \int \psi_{2s}^{*} \psi_{2s} \, d\tau \) over all space is unity.
2. Calculate the average distance from the nucleus of an electron in the 2s orbital.
3. Find the value \( C \) that normalizes the \( \psi_{3p_z} \) orbital.
   \[
   \psi_{3p_z} = Cr \left( 6 - r \right) e^{-r/\alpha} \cos \theta
   \]
4. Calculate the average value of \( r^2 \) for the \( \psi_{3p_z} \) orbital.
5. Show that \( f = \frac{e^{ar}}{r} \), where \( a \) is an arbitrary number, satisfies \( \nabla^2 f = a^2 f \).