

Hydrogen radius

Verify

$$\langle r \rangle = \frac{3n^2 - l(l+1)}{2} a_0$$

for selected wave functions ψ_{nlm} .

The Eigenmath code proceeds as follows:

Determine the probability density function $f(r)$.

$$f(r) = \int_0^\pi \int_0^{2\pi} |\psi_{nlm}|^2 r^2 \sin \theta \, d\theta \, d\phi$$

Calculate the expectation value.

$$\langle r \rangle = \int_0^\infty r f(r) \, dr$$