

5.3 Optimization

H Physics

Ex 1. The radial probability density (for $n = 2$, $l = 1$, $m = 0$) for the hydrogen atom can be written as:

$$P(r) = Cr^4 e^{-r/a}$$

where C is a constant, and $a = 0.529 \times 10^{-10} \text{ m}$.

Find the most likely position (r) of the electron (find the radius r where $P(r)$ is maximum).

Ex 2. The position function for a particle is given by:

$$s(t) = 2te^{-t}, \quad t \geq 0.$$

a) Find the maximum value for the position s .

b) Find the minimum value for the velocity $v = s'$.

Reading: Nelson Textbook, Pages 241-244 (Optimization Problems Involving Exponential Functions)

Homework: Nelson Textbook: Page 245 #3, 5, 6, 10, 11, 12, 13, 14