Task for Module 2.1

Introduction to Quantum Mechanics

July 15, 2021

Due at 11:59 PM 16/07/2021

Instructions

- Solutions should be written on A4-sized sheets.
- Page numbers should be mentioned in the bottom-right corner, and roll number should be mentioned in the bottom-right corner **of each page**.
- Scan and upload the PDF through **this google form**.

Question 1 Gaussian wave-packet

Prove that the uncertainty product $\Delta\mathsf{X} \cdot \Delta\mathsf{P}$ is minimum ($= \hbar/2$) for a **Gaussian wavefunction** given by

$$\Psi(x) = \frac{1}{(\pi\sigma^2)^{\frac{1}{4}}} \exp\left\{-\frac{(x-x_0)^2}{2\sigma^2}\right\} \exp\left\{\frac{ip_0}{\hbar}x\right\}$$

Question 2 1D Infinite square well

Derive the expression for the spatial part $\psi(x)$ of the wavefunction of a particle in an **infinite square well**, defined in the range $0 \leq x \leq a$.