

Homework Set #2.

Due Date: Wednesday January 23, 2019

1. Calculate $\langle p \rangle$ and $\langle p^2 \rangle$ on the Gaussian wave packet α whose wave function is

$$\langle x' | \alpha \rangle = \frac{1}{\pi^{1/4} \sqrt{d}} \exp\left(ikx' - \frac{x'^2}{2d^2}\right).$$

[2 points]

2. Evaluate the $x - p$ uncertainty product $\langle (\Delta x)^2 \rangle \langle (\Delta p)^2 \rangle$ for a one-dimensional particle confined between two rigid walls:

$$V = 0 \text{ for } 0 < x < a; \quad V = \infty \text{ otherwise.}$$

Do this for both the ground and excited states. [5 points]

3. Calculate the uncertainty $\langle (\Delta p)^2 \rangle$ in the momentum, and the uncertainty product $\langle (\Delta x)^2 \rangle \langle (\Delta p)^2 \rangle$ for the following wave function $\psi(x)$

$$\psi(x) = 1/\sqrt{2a} \text{ for } |x| < a; \quad \psi(x) = 0 \text{ otherwise.}$$

[3 points]