

## Quantum Mechanics 1 – Problem 9

The spatial wave function describing the possible states of a particle confined in an infinite 1-dimensional potential square well of width  $L$  is

$$\psi_n(x) = A \sin\left(\frac{n\pi x}{L}\right),$$

where the quantum number  $n > 0$  is any positive integer.

- a) Show that the constant that normalises the wave function is

$$A = \sqrt{\frac{2}{L}}.$$

[4 marks]

- b) Hence, for a particle in the  $n = 1$  state, find the probability of finding the particle in the region

$$\frac{L}{4} \leq x \leq \frac{3L}{4}.$$

How does your answer compare to the classically expected value?

[4 marks]

- c) Sketch the spatial wave function and the probability density function for the  $n = 2$  state.

[2 marks]