

PHYS1140 Spring 2024 Class04 Activity-Calculating Parameters From Wavefunctions

- a) Assume that the wavefunction of a square pulse at time zero is

$$\Psi(x, 0) = \begin{cases} 0 & \text{for } x < -a \\ \frac{1}{\sqrt{2a}} & \text{for } -a < x < a \\ 0 & \text{for } x > a \end{cases}$$

Sketch the pulse and estimate the mean and standard deviation of the pulse.

- b) Find the standard deviation $\sqrt{\langle x^2 \rangle - \langle x \rangle^2}$ of this distribution.

- c) Find $A(k)$ by doing a Fourier transform.

- d) Find the standard deviation in k for your $A(k)$ by integration of probability densities.

- e) Does this wavefunction obey the Heisenberg Uncertainty Principle? Explain.