

PHY 341 HW Ch.1a

Do problems 1.2, 1.4, 1.7; plus the following:

q1-1

In a class of 10 students, the following table lists the number of organized/individual sports and the number of students playing them:

sports	0	1	2	3	4+
students	1	4	3	2	0

- (a) Calculate the probability of a student playing n sports, p_n .
- (b) Calculate the average number of sports $\langle n \rangle$ per student and the average number squared $\langle n^2 \rangle$. Compare and explain the two values.

q1-2

We have the following wave function,

$$\psi(x, t) = Ae^{-|x|/a - i\omega t}$$

where $A, a > 0, \omega$ are real constants.

- (a) Sketch the wave function at $t = 0$ and the probability.
- (b) Find the normalization constant A .
- (c) Calculate the expectation values $\langle x \rangle$ and $\langle x^2 \rangle$.

q1-3

The wave function $\psi(x, t)$ is defined for $0 \leq x \leq L$ as

$$\psi(x, t) = A\sqrt{x(L-x)} \exp(-i\omega t).$$

- (a) Sketch the wave function at $t = 0$ and the probability. Where is the maximum?
- (b) Determine the normalization constant A . What is the dimension of A ? ψ ?
- (c) Calculate the expectation values $\langle x \rangle$ and $\langle x^2 \rangle$.
- (d) Find the uncertainty $\Delta x = \sqrt{\langle x^2 \rangle - \langle x \rangle^2}$.