

## PHY 341 HW Ch.1a

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

### q1-1

In a class of 10 people, the following table lists the number of pets (dogs, cats, and rabbits) and the number of students having them:

pets	0	1	2	3
students	2	5	2	1

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

### q1-2

We have the following wave function,

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

where  $A, a > 0, E$  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  $A$ ?  $\psi$ ?
- (c) Calculate the expectation values  $\langle x \rangle$  and  $\langle x^2 \rangle$ .
- (d) Find the uncertainty  $\Delta x = \sqrt{\langle x^2 \rangle - \langle x \rangle^2}$ .