Homework 04:

A1. Use some program like MATHEMATICA, Maple, or MATLAB to make a plot like Fig. 4.3(c) in your text. Repeat your plot several times. (You have 36 coins, so use 36 bins in your histogram.)

- What *should* this plot look like in principle?
- If you use 570 trials instead of 57, is there a qualitative change in the plots? How about 5700? Explain.
- How many trials are necessary to make the plot look like what you expected? (If you didn't expect anything in particular, think harder.) Explain.
- Include a couple of plots that demonstrate your findings. Include a printout of your code as well.

A2. Write a one-dimensional random walker program. (If this sounds too hard for you—you're not a programmer—come see me and I'll help you. If you've had Physics 230 [or equivalent experience], you should be able to do this.)

- Plot x_i as a function of i for a single walker (i is the step number). Do this several times. What do you observe? Any take home messages? Attach a plot that includes, in a single graph, the trajectory of many walkers. (optional: What kind of a "shape" do all the trajectories together make?)
- Plot x_i^2 as a function of i for a single walker (like Fig. 4.5(a) in the text). Do this several times. What do you observe? Any take home messages?
- Average x_i^2 over many walkers (that is, plot $\langle x_i^2 \rangle$ where the average is taken using lots of walkers). Plot the diffusion law on the same graph. Attach the graph. What do you observe? Any take home messages?

Do problem **4.1**, part a only, in the text

Do problem **4.2** in the text