Practice Problems Related to Random Walks

Write a code to do a one-dimensional random walk using a specified distribution of distances at each step (and the assumption that it is equally likely to take a step to the left as to the right). With this code:

1. Assume the distribution of step lengths x is uniform between 0 and 2. For many different iterations calculate, and plot, the distribution of net distance traveled for 1, 10, 100, and 1000 steps.

2. Do the same thing when the probability of a step of length x is e^{-x}. How do your answers compare with the answers to problem 1?

3. Using the first step length distribution, compute the typical number of scatterings to an edge if the edge is at -0.1 and +0.1 from the origin, and similarly for ± 1, ± 10, and ± 100. To be clear, for the 0.1 edge, most of the time there will be no scattering, because the step length will be larger than the distance to the edge.

4. Repeat the previous problem using $P(x) = e^{-x}$.

The means of the two distance distributions are the same. What do the results of your numerical experiments tell you about random walks?