Problem Set #2: Due on Thur. 28 Jan.

#1 Reif 1.5 (Assume the drum is spun after each trigger pull. Note that this problem cannot be mapped onto a random walk, so you should not be using combinatorial factors.)

#2 A beam of neutrons impinges on a thin gold foil. The neutrons are scattered only by the gold nuclei, which occupy a negligible fraction of the foil volume. When the beam is “on” for a time period $\tau$, the average number of neutrons scattered is 4. Use the Poisson distribution to answer the following questions: (a) What is the probability that no neutrons are scattered while the beam is on? (b) What is the probability that exactly 2 neutrons are scattered? (c) If the beam is left on for a time period $\tau/2$ what happens to the probabilities you found in parts (a) and (b)? (The formula for the Poisson distribution is given in Reif, Problem 1.9, and remember that it applies only when $\lambda$, the mean value of $n$, is small.)

#3 A. Reif 1.16, skip part (d) B. Reif 1.17

#4 Reif: 1.18 The molecules move in 3 dimensions. Would your answer change if the gas molecules were restricted to move only in two dimensions?

#5 Do Reif 1.22 but instead of the given function, use $w(s)ds = l^{-1} \exp(-s/l)ds$, where $l$ is a constant; $s$ varies from 0 to $\infty$. 