Review for Midterm (Wed., Feb. 11)

The midterm will cover:

- Ch. 2, *except* Secs. 2.8, 2.11.3, 2.11.4, 2.16, 2.17.
- Notes on Basic Probability, Monte Carlo Methods, and Markov Chains.
- Ch. 3, *except* Secs. 3.6 and 3.7.

To review:

1. Make sure you can do all of the assigned homework exercises. Also do Section 3.5, #7, 8, 10, 11, 17, 18.

2. For extra practice, choose additional related problems in Chs. 2 and 3. Many have answers in the back.

3. Make sure you understand *expected value*, *variance*, the *law of large numbers*, and the *central limit theorem*.

   A random variable X_1 takes on the value 2 with probability .4 and 3 with probability .6. What is the expected value and variance of X_1?

   There are 10000 independent identically distributed random variables $X_1, \ldots, X_{10000}$, each with the distribution described above. Define the random variable A by

   $$A = \frac{1}{10000} \sum_{i=1}^{10000} X_i.$$

   What is the expected value and variance of A? Sketch its probability density function, labeling the mean and standard deviation. What is the expected value and variance of $4A$?

4. Make sure you understand random walks and Markov chains.

   A walker can go to any of four positions: 0, 1, 2, or 3. From positions 1 or 2, he moves right one space with probability 1/2, he moves left one space with probability 1/4, and he stays where he is with probability 1/4. From position 0, he moves right with probability 1/2 and stays where he is with probability 1/2. If he reaches position 3, he stays there. He starts in position 1. What are his possible positions after 2 steps and what is the probability of each?