Probability Practice Final Exam

Exam 6:00–8:00 on Saturday, December 8

1   In the Florida election there were 6 million voters, and the difference in number of votes between the two candidates was about 500. Assume that each voter was equally likely to choose Bush or Gore, and determine the likelihood that their final totals would be within 500 of each other.

2   Assume that the *actual* voter preference was that 500 more people prefer Bush to Gore. Using the technique of Section 9.1, how many people would you have to poll in order to predict the outcome of the election with 95% certainty? Explain your result.

3   In a Markov chain the next state is determined only by the current state. Suppose we have an experiment that is more complicated. There are four coins
- Coin 1 has probability $\frac{1}{5}$ of H
- Coin 2 has probability $\frac{2}{5}$ of H
- Coin 3 has probability $\frac{3}{5}$ of H
- Coin 4 has probability $\frac{4}{5}$ of H. At each step, we choose a coin to flip based on the current flip and the previous flip, according to the rule:
- HH, choose Coin 1
- HT, choose Coin 2
- TH, choose Coin 3
- TT, choose Coin 4. Make this experiment into a Markov chain in which the states are the possible lists of what happened last time and what happened this time: $S = \{HH, HT, TH, TT\}$. Write down the transition matrix. Is this Markov chain absorbing?

4   Generalize number 3. Suppose I have a procedure in which the next outcome depends on the current outcome and each of the k outcomes that came before. Show how to think of this as a Markov chain. Describe the states of your Markov chain explicitly, and explain what the transition matrix would look like.

5   Problems 14, 19 in Section 6.1

6   Problems 8, 15 in Section 6.2

7   Problem 9 in Section 8.1

8   Problems 4, 12 in Section 9.1

9   Problems 7, 8, 13, 14 in Section 9.2

10   Problem 9, 12 in Section 11.2