

## STA447/2006 (Stochastic Processes), Winter 2008

### Homework #1

**Due:** In class by 6:10 p.m. **sharp** on Thursday January 31. (If you prefer, you may bring your assignment to the instructor's office, Sidney Smith Hall room 6024, any time before it is due; slide it under the door if he is not in.) **Warning: Late homeworks, even by one minute, will be penalised!** (See the "Grade-Related Course Policies".)

**Note:** You are welcome to discuss these problems in general terms with your classmates. However, you should figure out the details of your solutions, and write up your solutions, entirely on your own. Copying other solutions is strictly prohibited!

**THE ASSIGNMENT:** [Point values are indicated in square brackets. The questions are listed in a "logical" order, but you may answer them in any order you wish. It is very important to **EXPLAIN** all your solutions very clearly.]

**Include at the top of the first page:** Your name and student number, and whether you are enrolled in STA447 or STA2006.

1. Text exercise 9.4 (p. 89) [5 points].
2. Text exercise 9.8 (pp. 89–90), parts (a) [5 points] and (b) [5 points].
3. Consider a Markov chain with  $S = \{1, 2, 3, 4, 5, 6, 7\}$ , and with

$$P = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1/2 & 0 & 1/2 & 0 & 0 & 0 & 0 \\ 0 & 1/5 & 4/5 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1/3 & 1/3 & 1/3 & 0 & 0 \\ 1/10 & 0 & 0 & 0 & 7/10 & 0 & 1/5 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

- (a) Which points are recurrent and which are transient? [5 points]
  - (b) Compute  $f_{i1}$  for each  $i \in S$ . (Hint: leave  $f_{41}$  until last.) [5 points]
4. Text exercise 9.1 (p. 88) [10 points].
  5. Text exercise 9.36 (p. 95), parts (a) [5 points] and (b) [5 points]. [Hint: for (b), check detailed balance. Part (c) is not assigned, but you may still think about it.]
  6. Text exercise 9.32 (pp. 94–95), parts (a) [5 points] and (b) [5 points].
  7. Text exercise 9.31 (p. 94), parts (a) [5 points] and (b) [5 points]. [Hint: for (b), proceed as in exercise 9.32. The answer is provided on p. 275.]
  8. Text exercise 9.35 (p. 95) [10 points]. [Hint: Show the Markov chain is irreducible and doubly stochastic.]