18.06 Problem Set 7

Due Wednesday, April 18, 2007 at **4:00 p.m.** in 2-106

Problem 1 *Wednesday 4/11*

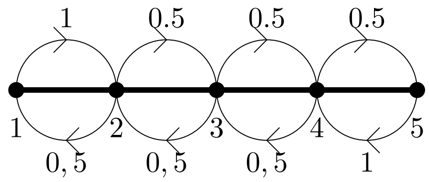
Do problem 9 of section 8.3 in your book.

Problem 2 *Wednesday 4/11*

Do problem 12 of section 8.3 in your book.

Problem 3 *Wednesday 4/11*

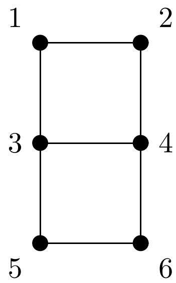
Consider the random walk on the 5-path as shown below. More precisely, $Prob(i, i+1) = Prob(i, i-1) = 1/2$ for $i = 2, 3, 4$; and $Prob(1, 2) = Prob(5, 4) = 1$. Here $Prob(i, j)$ is the probability to go from the i-th node to the j-th node.



The path is the thick horizontal line. The oriented arcs show the probability of taking that segment of path in that direction.
Find the eigenvalues and the steady state distribution for this Markov chain. (You can use `MATLAB`, if you like.)

Problem 4 *Wednesday 4/11*

Consider the 3×2 grid shown below. Assume an ant starts in vertex 1. At every step, if the ant is in vertex n, it either stays where it is with probability $\frac{1}{2n}$ or moves to an adjacent vertex selected uniformly among the current neighbors.



(a) What matrix A represents this Markov Chain?
(b) What is the sum of the eigenvalues of A?
(c) Use `MATLAB` to compute the eigenvalues of A.
(d) What is the steady state? What is the probability that in teh steady state the ant is on vertex 6? Does this agree with your intuition?

Problem 5 *Friday 4/13*

Do problem 2 of section 8.5 in your book.

Problem 6 *Friday 4/13*

Do problem 12 of section 8.5 in your book. You don't have to write the "differentiation matrix" (this involves concepts of chapter 7 that you haven't learned yet).

Problem 7 *Friday 4/13*

Do problem 1 of section 10.2 in your book.

Problem 8 *Friday 4/13*

Do problem 10 of section 10.2 in your book.

Problem 9 *Friday 4/13*

Do problem 16 of section 10.2 in your book.

Problem 10 *Friday 4/13*

Do problem 17 of section 10.2 in your book.