CS 519: Assignment 3

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Due Date: 1^{st} November 2016

Problem 1.
Consider a Markov chain with three possible states 1, 2, and 3, and the following transition probability matrix

$$\begin{bmatrix} \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ \frac{1}{3} & 0 & \frac{2}{3} \\ \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$$

Lets assume that all three states are equally likely to be initial state. Let X_i indicates the state of the Markov chain at time or step i.
Find out
(I) $P(X_0 = 1, X_1 = 2)$
(II) $P(X_0 = 1, X_1 = 2, X_2 = 3)$

Problem 2. Below all problems are from Grinstead and Snell Book.

1. Sec 11.1 - Problem Nos: 11, 19
2. Sec 11.2 - Problem Nos: 9, 13, 15
3. Sec 11.3 - Problem Nos: 2, 3, 5(c), 6
4. Sec 12.1 - Problem No: 8
5. Sec 12.2 - Problem No: 5

Problem 3. Let $P = (1, 2, -1)$. Find the point of intersection of the plane $3x-4y+z = 2$ with the line through P, perpendicular to that plane.

Problem 4. Three planes can fail to have an intersection point, even if no planes are parallel. Construct such an example.

Problem 5. A system of equations is given below.

$$\begin{aligned} 2x + 5y + z &= 0 \\ 4x + ay + z &= 2 \\ y - z &= 3 \end{aligned}$$

1. Which number a forces a row exchange and what is the triangular system (not leading to singular case) for that a?
2. Which a makes this system of equations singular (i.e. with no third pivot)?