MTH 371: Assignment II

November 3, 2021

Instructions

- Use statistical software R for your codes.
- Only basic built-in functions available in R are allowed.
- In each question, show the simulations with relevant graphs.
- Due date is November 12 (11.59 p.m. IST). No late assignments will be accepted.
- Submit all of your work which include the codes, results, graphs and reports.

1. (10 Marks) Let there be a discrete time Markov chain with the state space $S = \{1, 2\}$. The one step transition probability is given by

$$P = \begin{bmatrix} 0.3 & 0.7 \\ 0.5 & 0.5 \end{bmatrix}$$

It is given that when the process starts the MC was in state 1. Answer the following.

(a) Simulate five times a 50 steps Markov chain. Construct a plot comparing time to the states of the process.

(b) What will be P^{10}, P^{20}, P^{50}. What do you observe.

2. (5 Marks) Gambler's Ruin Problem: Consider there are two gamblers, A and B in the game. They start with total $M = 10$ dollars. When the game starts each player has 5 dollars with them. The probability of winning of A is $p = 0.8$ while the probability of winning of B is $1 - p = 0.2$. Consider all

the assumptions of 1-D random walk and Gambler's ruin problem are met.

Simulate the corresponding 1-D random walk and plot the results.
(Hint: You can simply plot the movement of gambler A w.r.t. time.)