**第四次作业**

2024.06.24课堂上交

Please print your coursework and submit this time!

1. (40 points) Two players A and B play a game consecutively till one of them loses all his capital. Suppose A starts with a capital of $2 and B with a capital of $3 and the loser pays $1 to the winner in each game. Let the probability of losing each game for A is 1/4. Please plot the probability of no ruin for 1,2,...,20 games (as in lesson 15), and give the probability of no ruin for 10 games.



the probability of no ruin for 1,2,...,20 games

Probability of no ruin for the first 10 games:

Game 1: 1

Game 2: 0.9375

Game 3: 0.51562

Game 4: 0.49219

Game 5: 0.25488

Game 6: 0.2439

Game 7: 0.12524

Game 8: 0.11989

Game 9: 0.061489

Game 10: 0.058863

1. (40 points) Supposed that there are totally 4 shampoos in the market, referred to as A, B, C and D. If a person uses shampoo A in this month, he/she will change to use shampoos A, B, C and D with probability 0.7, 0.1, 0.1 and 0.1, respectively. If a person uses shampoo B in this month, he/she will change to use shampoos A, B, C and D with probability 0.2, 0.4, 0.2 and 0.2, respectively. If a person uses shampoo C in this month, he/she will change to use shampoos A, B, C and D with probability 0.1, 0.1, 0.6 and 0.2, respectively. If a person uses shampoo D in this month, he/she will change to use shampoos A, B, C and D with probability 0.3, 0, 0.3 and 0.4, respectively. If the market shares of the shampoos A, B, C and D are all 25% in the beginning, Please plot the market shares of them for 1,2,...,24 months (as in lesson 15). What is the market shares of them in month 2 and month 12? (you can use code to compute the result, but I suggest you to calculate the result of month 2 by yourself as a practice)



the market shares of them for 1,2,...,24 months

1. (20 points) Supposed that there are totally 2 shampoos in the market, referred to as A and B. If a person uses shampoo A in this month, he/she will change to use shampoos A and B with probability 0.6 and 0.4, respectively. If a person uses shampoo B in this month, he/she will change to use shampoos A and B with probability 0.2 and 0.8, respectively. Calculate the stationary distributions of the market shares of the 2 shampoos.