Applied Stochastic Processes

Homework 1

CHEUNG Ying Lun

Please send your solution and the R file to `cheungyinglun@cueb.edu.cn`. Each group only needs to send one copy of solution.

Exercise 1 *Find the value of π through simulation.*

Exercise 2 *Suppose $X \sim Geo(p)$ with $p = 0.2$. Find $\mathbb{E}[g(X)]$ through simulation, where*

- $g(X) = |X|^3$.
- $g(X) = \cos(X)$.
- $g(X) = \mathrm{e}^X$.
- $g(X) = \log(X^4 + X^2)$

Exercise 3 *Let $X_1, X_2, \ldots$ be a sequence of independent Poisson random variables with parameter $\lambda = 0.2$. Let*

$$S_N = \sum_{i=1}^{N} X_i.$$

1. *Find the mean μ_N and variance σ_N^2 of S_N when $N = 10, 20, 100, 1000$.*
2. *Plot the distribution of $\sigma_N^{-1}(S_N - \mu_N)$ when $N = 10, 20, 100, 1000$.*