PROBABILITY & STATISTICS

Homework assignment 1 - due December 22th, 2023

Instructions

Please turn in the homework with this cover page. You do not need to edit the solutions. Just make sure the handwriting is legible. You may discuss the problems with your peers but the final solutions should be your work.

STATEMENT: With my signature I confirm that the solutions are the product of my own work. Name: _____   Signature: _____.

1. Do the following problems from Rice's book:

   Chapter 1: 30, 47, 54, 78, 79.

   Chapter 2: 14, 58, 67, 71,72.

2. Let the random variable X have the density

$$f_X(x) = \frac{2}{(e^x + e^{-x})^2} = \frac{1}{2\cosh^2 x}$$

   for $x \in \mathbb{R}$.

   a. Compute the density of the random variable

$$U = \frac{1}{2}\left(1 + \frac{e^X - e^{-X}}{e^X + e^{-X}}\right).$$

   b. For $p \in (0, 1)$ compute

$$P\left(X \le \frac{1}{2}\log\left(\frac{1+p}{1-p}\right)\right).$$

3. Eight positions are arranged in a circle. Every position is independently assigned the value 0 or 1 with probability $\frac{1}{2}$ respectively.

   a. Find the probability that no 5 contiguous positions are assigned the value 0.

   b. Let B be the event that we do not get 5 contiguous positions with 0s assigned, and let A be the event that we get at least 5 contiguous positions with 1s assigned. Find $P(A|B)$.