Quiz 1

Your name:

Problem 1

Explain the following criteria for a *good* estimator.[15pts]

- unbiased estimator
- consistent estimator
- maximum-likelihood (ML) estimator

Problem 2

Consider a function $f(x) = 1 + 1/x$, we are interested in finding a solution, x^*, that solves $f(x) = x$. Provide a precise Pseudo code for a numerical algorithm that uses the fixed point theorem.`[10pts]`

Problem 3

Complete the following definition of the memory-less property. Your answer must include an equation that involves probability terms.[10pts]

A random variable X is said to be memoryless if$\cdots$

Problem 4

Supposed that $X_1 \sim exp(\lambda_1)$, $X_2 \sim exp(\lambda_2)$, and they are independent. Prove the following statement. Mathematical proof is expected.`[10pts]`

$$min(X_1, X_2) \sim exp(\lambda_1 + \lambda_2).$$

Problem 5

Suppose $X \sim U(20, 40)$. Evaluate $\mathbb{E}[min(X, 25)]$. A numeric answer is expected.`[10pts]`

Problem 6

We want to generate a random number x, which is sampled from $X \sim exp(5)$. We picked $u = 0.3$ from $U(0, 1)$. Use the inverse transform method to generate x. A numeric answer is expected.`[10pts]`

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