ESE 503 - Simulation Modeling & Analysis (Assignment #3)

Summer Semester, 2020 M. Carchidi

Problem #1 (20 points) - A Moment Generating Function

Suppose that X is a "lopsided" double exponential random variable having pdf

$$f(x) = \begin{cases} Ae^{\lambda_1 x}, & \text{when } x < 0 \\ \\ Ae^{-\lambda_2 x}, & \text{when } x > 0 \end{cases}$$

where λ_1 and λ_2 are two positive parameters. Determine the value of A and construct the moment generating function for X. Then use this to compute $E(X)$ and $V(X)$.

Problem #2 (20 points) - A Sum Of Two Independent Random Variables

Suppose that X is exponential with parameter λ and that Y is uniform between a and b with $a < b$. Determine the pdf and cdf of $Z = X + Y$.

Problem #3 (20 points) - Playing a Game With Two Coins

Suppose that A and B have two coins. A's coin has a probability of p of coming up heads on a single flip and B's coin has a probability of q of coming up heads on a single flip. The two players A and B are going to play a game in which A and B take turns at flipping their respective coins until one of them flips a heads and the one that flips a heads first is the winner.

a.) (**5 points**) If A is the first to flip, compute (in terms of p and q) the probability that A wins and compute (in terms of p and q) the probability that B wins.

b.) (**5 points**) Determine how p and q must be related if the game is to fair. That is, determine how p and q must be related if A and B are to have the same probability of winning the game.

c.) (**5 points**) Compute (in terms of p and q) the average number of flips required before either A or B wins, which is the average number of flips in a typical game.

d.) (**5 points**) Verify each of your results above by running a Monte-Carlo simulation of this game being played more that 2000 times.
