

Homework 5

Exercises to Turn In. Due Date: Friday, February 25

1. Ross 3.1. Draw pictures.
2. (From Russ Lyon's notes): Let $N_1(t)$ and $N_2(t)$ be independent renewal processes both with uniform $(0, 1)$ inter-arrival distributions. Let $N(t) = N_1(t) + N_2(t)$.
 - (a) Are the inter-arrival times of N independent?
 - (b) Are the inter-arrival times of N identically distributed?
 - (c) Is N a renewal process?

Hint: Consider only the first two inter-arrival times for N . You do not have to figure out the densities/distributions. Just state what they are in terms of the variables for the N_1 and N_2 and N processes. Again, draw a picture.

3. Ross 3.3. The point of this problem is important: the interval containing a watched point (t) will be longer than an arbitrary interval. To show this, condition on $S_{N(t)} = s$. What does knowing $S_{N(t)} = s$ tell you about the length of the interval containing t ? The distribution of $X_{N(t)+1}$ for a Poisson Process is a little tricky, but can be done with the hints given in class. It will be extra credit on this assignment.
4. Ross 3.7. Try to give a different proof than that in the back of the text by using Proposition 3.2.1.
5. Ross 3.9. Arguments here are similar to my heuristic arguments in class about the probability the queue was empty, the mean length of the empty period, and the mean length of the busy period for the M/G/1 queue.