Homework 1

1. For a Poisson process show, for $s < t$, that

$$P\{N(s) = k | N(t) = n\} = \binom{n}{k}\left(\frac{s}{t}\right)^k\left(1 - \frac{s}{t}\right)^{n-k}, k = 0, 1, \ldots, n$$

2. Let $T_1, T_2, \ldots$ denote the interarrival times of events of a nonhomogeneous Poisson process having intensity function $\lambda(t)$.

   (a) Are the T_i independent?

   (b) Are the T_i identically distributed?

   (c) Find the distribution of T_1.

3. Cars pass a certain street location according to a Poisson process with rate λ. A person wanting to cross the street at that location waits until she can see that no cars will come by in the next T time units. Find the expected time that the person waits before starting to cross. (Note for instance, that if no cars will be passing in the first T time

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units then the waiting time is 0.)