1 Homework 12

You will find all the problems for this homework in this document. You are responsible for uploading a pdf document with all of your results and the necessary work to the Canvas shell for the class. Please make sure that your homework pdf is legible, clear, and pledged.

1. For a compensated compound Poisson process given by

$$J(t) = Q(t) - \alpha\lambda t$$

   where $Q(t)$ is a compound Poisson process with $\mathbb{E}[Y_i] = \alpha$ and the Poisson process $N(t)$ has intensity λ, prove that the process $J(t)$ is a martingale.

2. For a Poisson process with yearly intensity of 12, determine the probability that no events occur in the first three months? What would be the monthly intensity of this process?

3. Define a process

$$X(t) = e^{N(t)-\lambda t(e-1)}$$

   where $N(t)$ is a Poisson process with intensity λ. Is this process a martingale?

4. For two stocks, stock A and stock B, each has rare events that occur that can be modeled with independent Poisson processes with intensity 4 and 2 respectively. What is the probability that a total of 2 events occur in the first year?

