221 Spiking Networks
Exercise 2: Renewal processes

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Renewal process with linearly increasing hazard

Consider a renewal process of events separated by intervals t with linearly increasing hazard

$$\rho(t) = \frac{t}{a^2}$$

Derive analytically the survivor fraction $S(t)$, the interval density $P(t)$, the cumulative fraction $C(t)$, and the inverse survivor fraction

$$t = S^{-1}(u)$$

Moments of the interval density

Compute analytically the first and second moments of the intervals t:

$$E(t), \qquad E(t^2), \qquad E(t^2) - E^2(t)$$

Analyze simulated process

From $10,000$ uniformly distributed random numbers $u_i \in [0, 1]$, generate intervals

$$t_i = S^{-1}(u_i)$$

choosing $a = 20\, ms$.

Establish empirically the hazard, interval distribution, and survivor function!

Plot analytical and empirical functions together and compare!

Finally, compare analytical and empirical mean and variance of the intervals!