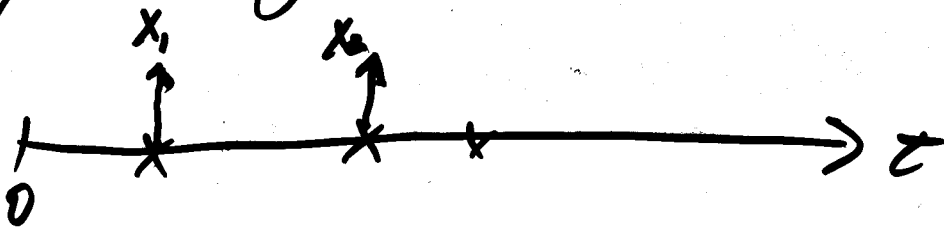


1. Let $\{X_t : t = 0, 1, \dots\}$ be a Galton Watson branching process with offspring pgf $G(s) = \frac{1}{2}s^2 + \frac{1}{4}s + \frac{1}{4}$. Take $X_0 = 1$. Find the probability of ultimate extinction.

2. Consider a Poisson process of rate 2 & the (marked) compound process



- where X_1, X_2, \dots are i.i.d exponential($\frac{1}{4}$)
Calculate $\text{Var}(\sum_{i=1}^{N(t)} X_i)$.

3. Let $\{N(t) | t \geq 0\}$ be a nonhomogeneous Poisson process of rate $\lambda(t)$. Show $N(t) \sim \text{Poisson}(\int_0^t \lambda(u) du)$