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Exponentiality of First Passage Times of Continuous Time Markov Chains

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Résumé en anglais	Let (X,P_x) be a continuous time Markov chain with finite or countable state space S and let T be its first passage time in a subset D of S. It is well known that if μ is a quasi-stationary distribution relative to T, then this time is exponentially distributed under Pμ. However, quasi-stationarity is not a necessary condition. In this paper, we determine more general conditions on an initial distribution μ for T to be exponentially distributed under Pμ. We show in addition how quasi-stationary distributions can be expressed in terms of any initial law which makes the distribution of T exponential. We also study two examples in branching processes where exponentiality does imply quasi-stationarity.
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