

Problem. Let Markov Chain starts with probability distribution $p^T(0) = (0, 1, 0, 0, 0)^T$. Assume that probability transition matrix has a form ($p_{ij} > 0$)

$$P = \begin{bmatrix} p_{11} & p_{12} & p_{13} & p_{14} & p_{15} \\ p_{21} & p_{22} & p_{23} & p_{24} & p_{25} \\ p_{31} & p_{32} & p_{33} & p_{34} & p_{35} \\ 0 & 0 & 0 & p_{44} & p_{45} \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix}.$$

Find $\lim_{t \rightarrow \infty} p(t)$, where $p(t+1)^T = p(t)^T P$. Hint: Use ergodic theorem for Markov chain.