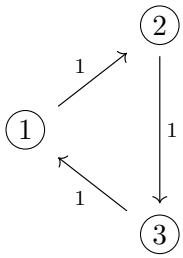
YOUR NAME:
YOUR TA usually:

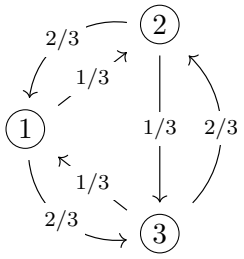
# Stochastic Modelling, Short test 1

26 September 2022, 12:25-12:45

**Question 1.** **(a)** Having started at state 1, does the following DTMC have $\pi^{occ}$ and $\pi^{lim}$? If yes, provide the distribution (an intuitive guess without calculation / motivation is enough); if not, explain why not.




**(b)** For any initial distribution, the following DTMC has both $\pi^{occ}$ and $\pi^{lim}$. Give an intuitive guess for what is the value of $\pi^{occ} = \pi^{lim}$, no calculation / motivation is required.

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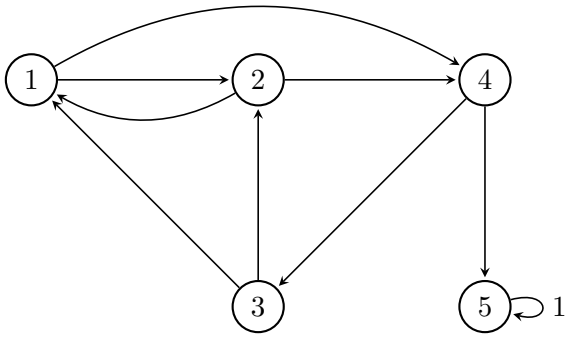
**Question 2** Consider a DTMC with the following transition diagram, where all transitions out of states 1, 2, 3, 4 have probability 1/2.




**(a)** Write down the system of equations that will let you find the expected time to reach (for the 1st time) state 5 from state 1. Which of the unknowns specifically do you want to know? You do not have to solve the system.

**(b)** What is the probability that, having started at state 1, the MC will reach state 5 for the 1st time in *exactly* 3 steps? In *at most* 10 steps? If you need a matrix raised to a power in your answer, you can keep the power as is in the answer but make sure to specify the matrix itself.