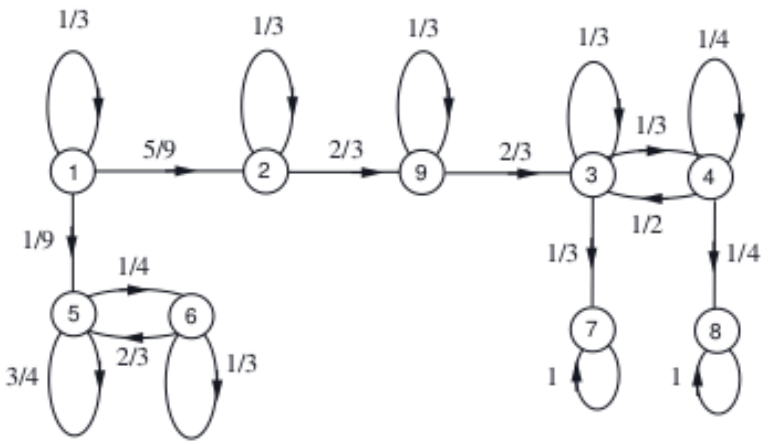
# 9. Exercise: Probability of absorption

None due May 29, 2020 05:29 IST

## Exercise: Probability of absorption

0.0/2.0 points (ungraded)

Consider again the Markov chain with the following transition probability graph:




Assuming that the Markov chain is initially in state 2 (i.e., $X_0 = 2$), what is the probability that the chain eventually reaches state 7?

**Answer:** 0.75

**Solution:**

Let $a_j$ be the probability that the Markov chain eventually reaches state 7 given that it started in state $j$. We want to calculate $a_2$. First note that $a_2 = a_3$ since the chain must eventually go from state 2 to state 9 to state 3 (after some number of self-transitions at states 2 and 9). Now we can write a system of two equations with two unknowns ($a_3$ and $a_4$) as follows:

$$a_3 = p_{33}a_3 + p_{34}a_4 + p_{37}a_7 = \frac{1}{3}a_3 + \frac{1}{3}a_4 + \frac{1}{3}\cdot 1$$
$$a_4 = p_{43}a_3 + p_{44}a_4 + p_{48}a_8 = \frac{1}{2}a_3 + \frac{1}{4}a_4 + \frac{1}{4}\cdot 0.$$

Solving, we obtain $a_4 = 1/2$ and $a_2 = a_3 = 3/4$.

Submit You have used 0 of 3 attempts

Answers are displayed within the problem

## Discussion

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**Topic:** Unit 10: Markov chains:Lec. 26: Absorption probabilities and expected time to absorption / 9. Exercise: Probability of absorption

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a3= a2? 4
Can someone show mathematically why this is true?

WA calculus. 2
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