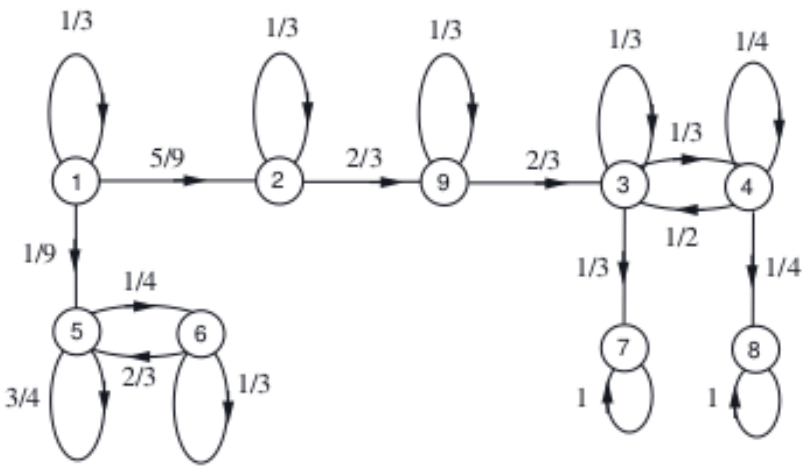
Exercise: Expected time to absorption

(2/2 points)

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



Assuming that $X_0 = 9$, what is the expected time until the Markov chain eventually reaches states 7 or 8?

19/4

✔ **Answer:** 4.75

- Unit 6: Further topics on random variables
- Unit 7: Bayesian inference
- Exam 2
- Unit 8: Limit theorems and classical statistics
- Unit 9: Bernoulli and Poisson processes
- **Unit 10: Markov chains**

Unit overview

Lec. 24: Finite-state Markov chains
Exercises 24 due May 18, 2016 at 23:59 UTC

Lec. 25: Steady-state behavior of Markov chains
Exercises 25 due May 18, 2016 at 23:59 UTC

Answer:
States 7 and 8 can be combined into a mega-state, say state 10. Let μ_j be the expected time to eventually reach state 10 given that the chain starts in state j. We want to calculate μ_9. We can write a system of three equations with three unknowns (μ_9, μ_3 and μ_4) as follows:

$$\begin{aligned}\mu_9 &= 1+\frac{1}{3}\mu_9+\frac{2}{3}\mu_3\\ \mu_3 &= 1+\frac{1}{3}\mu_3+\frac{1}{3}\mu_4\\ \mu_4 &= 1+\frac{1}{2}\mu_3+\frac{1}{4}\mu_4,\end{aligned}$$

which gives the solution $\mu_3 = 13/4$, $\mu_4 = 14/4$, and $\mu_9 = 19/4$.

You have used 1 of 2 submissions

Lec. 26: Absorption probabilities and expected time to absorption
Exercises 26 due May 18, 2016 at 23:59 UTC

Solved problems

Problem Set 10
Problem Set 10 due May 18, 2016 at 23:59 UTC

▸ Exit Survey

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