

Markov Chains

Quiz, 6 questions

1
point

1.

Find stationary distribution of Markov chain with the following 1-step transition matrix P:

$$P = \begin{pmatrix} 0 & 1/2 & 0 & 0 & 1/2 \\ 0 & 0 & 1 & 0 & 0 \\ 1/5 & 1/5 & 1/5 & 1/5 & 1/5 \\ 0 & 1/2 & 0 & 0 & 1/2 \\ 0 & 1/2 & 1/2 & 0 & 0 \end{pmatrix}$$

☐

$(\frac{1}{12} \frac{5}{12} \frac{3}{12} \frac{1}{12} \frac{2}{12})$

☐

$(\frac{1}{12} \frac{1}{12} \frac{5}{12} \frac{3}{12} \frac{2}{12})$

☐

$(\frac{2}{12} \frac{3}{12} \frac{5}{12} \frac{1}{12} \frac{1}{12})$

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$(\frac{1}{12} \frac{3}{12} \frac{5}{12} \frac{1}{12} \frac{2}{12})$

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2.

Choose all matrices which are, given the following 1-step transition matrices are ergodic Markov Chains:

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$$P_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{pmatrix}$$

$$P_2 = \begin{pmatrix} 0 & 1/2 & 0 & 1/2 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1/2 & 0 & 1/2 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

- ☐ P_1 and P_2
- ☐ P_2
- ☐ none of above
- ☒ P_1

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3.

Choose all periodic states of the Markov Chain with the following 1-step transition matrix:

$$P = \begin{pmatrix} 1/3 & 1/3 & 1/3 & 0 \\ 1/2 & 1/2 & 0 & 0 \\ 1/4 & 1/4 & 0 & 1/2 \\ 0 & 1/2 & 0 & 1/2 \end{pmatrix}$$

- ☐ 1 and 4
- ☐ 1,2 and 3
- ☐ 2, 3 and 4
- ☐ all states
- ☒ all states are aperiodic

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4.

Let's take the Markov Chain from the previous task. How many equivalence classes do this matrix obtain?

$$P = \begin{pmatrix} 1/3 & 1/3 & 1/3 & 0 \\ 1/2 & 1/2 & 0 & 0 \\ 1/4 & 1/4 & 0 & 1/2 \\ 0 & 1/2 & 0 & 1/2 \end{pmatrix}$$

- ☒ 1
- ☐ 4
- ☐ 2
- ☐ 3
- ☐ there is no any equivalence class

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5.

Assume that there is a series 0, 1, 2, ..., 9 in which numbers appear randomly and independently of each other with equal probabilities. Let x_n be a quantity of different numbers in n first elements of the series. Find a stationary distribution of this chain.

- ☐ (0 0 0 0 0 0 0 0 0 0.9 0.1)
- ☐ (0 0.1 0.9 0 0 0 0 0 0 0)
- ☒ (0 0 0 0 0 0 0 0 0 1)
- ☐ (0 1 0 0 0 0 0 0 0 0)

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6.

Draw a Markov Chain with the following 1-step transition matrix:

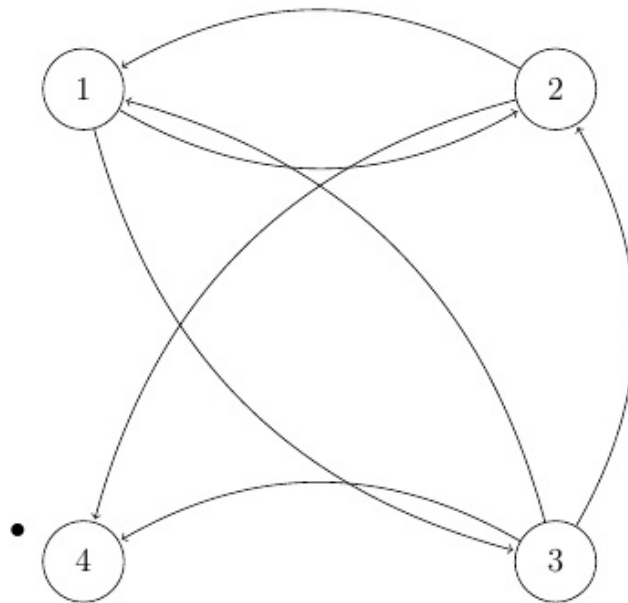
Markov Chains

$$P = \begin{pmatrix} 1/3 & 1/3 & 1/3 & 0 \\ 1/2 & 1/2 & 0 & 0 \\ 1/4 & 1/4 & 0 & 1/2 \\ 0 & 1/2 & 0 & 1/2 \end{pmatrix}$$

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The following graphic representation is correct:


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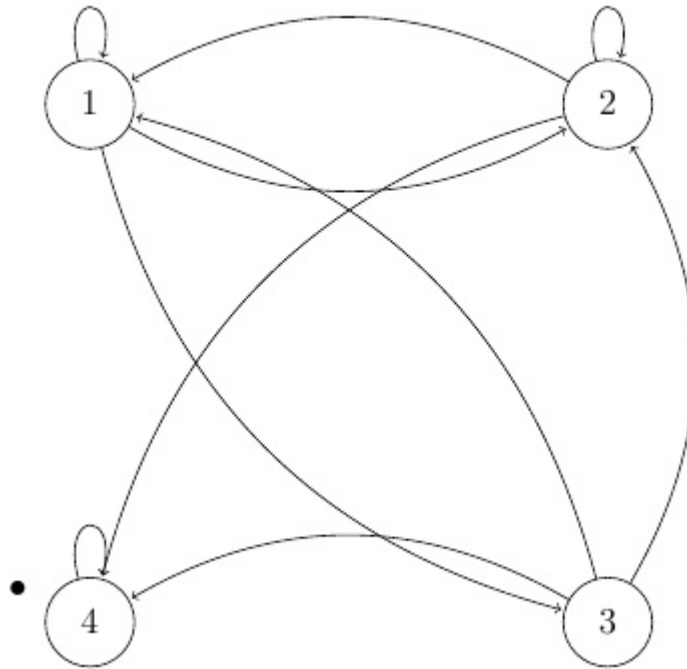
none of above

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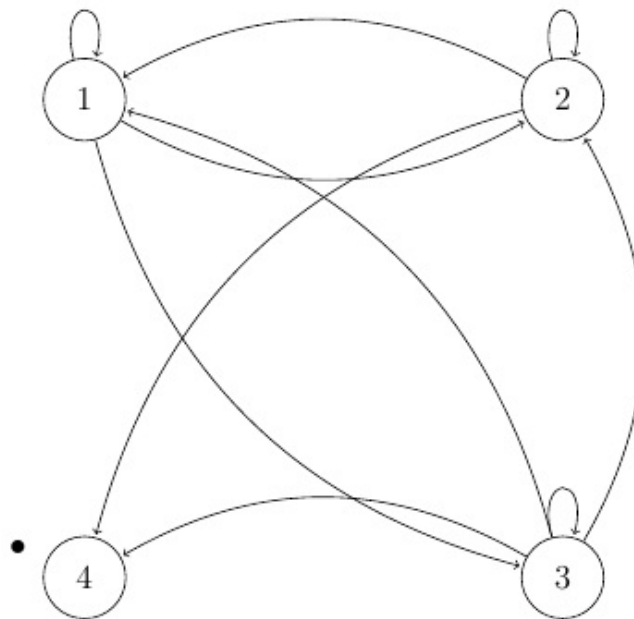
The following graphic representation is correct:

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The following graphic representation is correct:



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