Markov Chains

Quiz, 6 questions

<div style="border:1px solid">1
point</div>

1.

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

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

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

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

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

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

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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

○ P_1

○ none of above

1
point

3.
Choose all periodic states of the Markov Chain with the following 1-step transition matrix:

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

○ 1,2 and 3

○ all states are aperiodic

○ all states

○ 2, 3 and 4

○ 1 and 4

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1 point

4.

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

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

○ 3

○ 4

○ there is no any equivalence class

○ 1

○ 2

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1 point

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 0.9 0.1)

☐ (0 1 0 0 0 0 0 0 0 0 0)

☐ (0 0 0 0 0 0 0 0 0 0 1)

☐ (0 0.1 0.9 0 0 0 0 0 0 0 0)

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1 point

6.

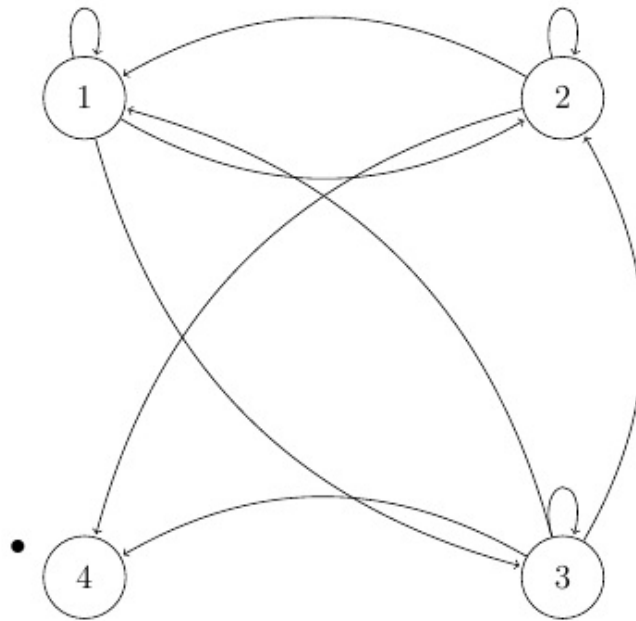Draw a Markov Chain with the following 1-step transition matrix:

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$$P = \begin{pmatrix} 1/3 & 1/3 & 1/3 & 0 \\ 1/2 & 1/2 & 0 & 0 \\ 1/4 & 1/4 & 0 & 1/2 \\ 0 & 1/2 & 0 & 1/2 \end{pmatrix}$$
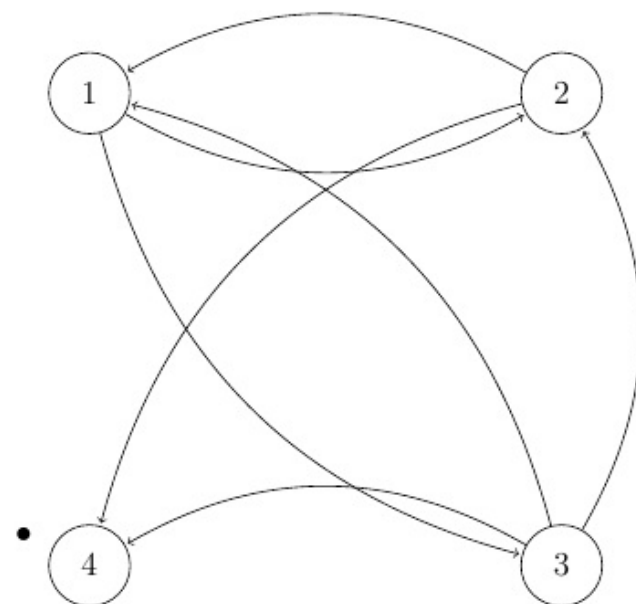
☐ The following graphic representation is correct:

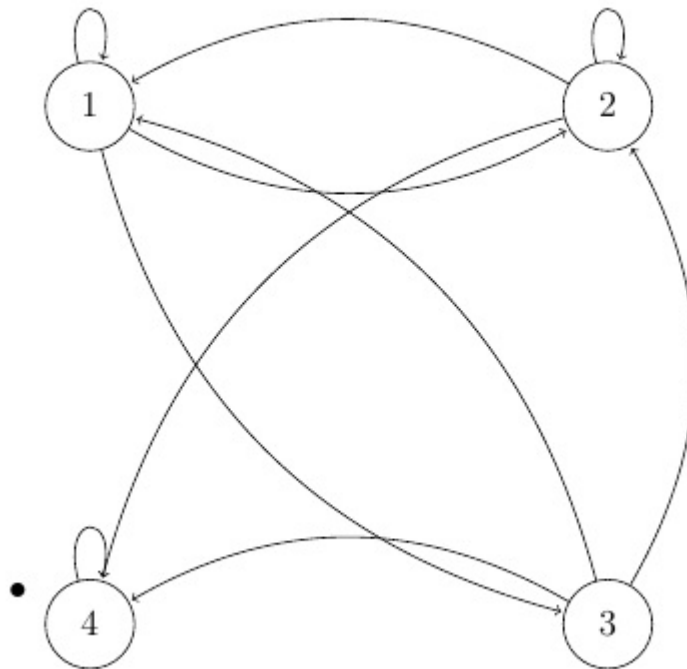☐ The following graphic representation is correct:

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The following graphic representation is correct:

☐ none of above

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