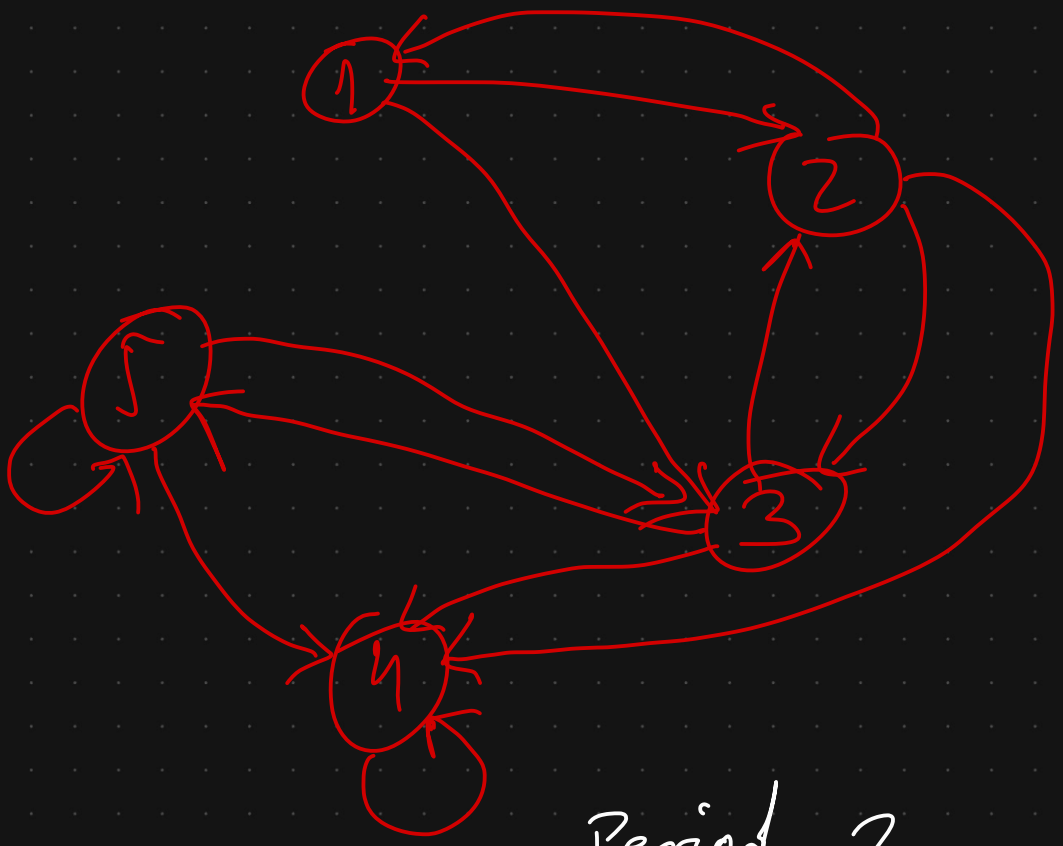
K 1



Period 2

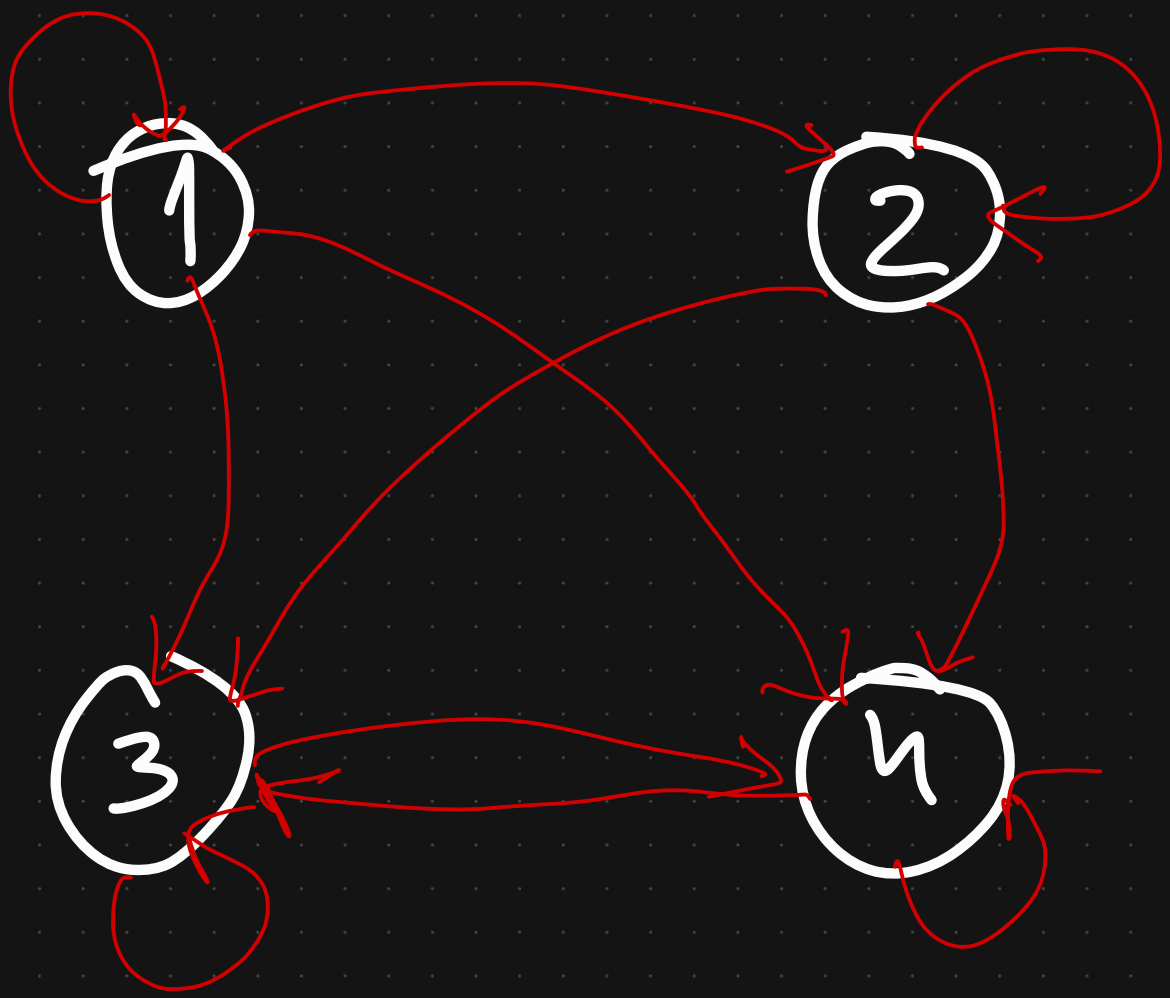
$\{1, 2, 3, 5\}$ } Not irreducible

$\{4\}$

$\Rightarrow$ aperiodic

Period $K^n(x,x) > 0 \; ; \; n \geq 1$

K2



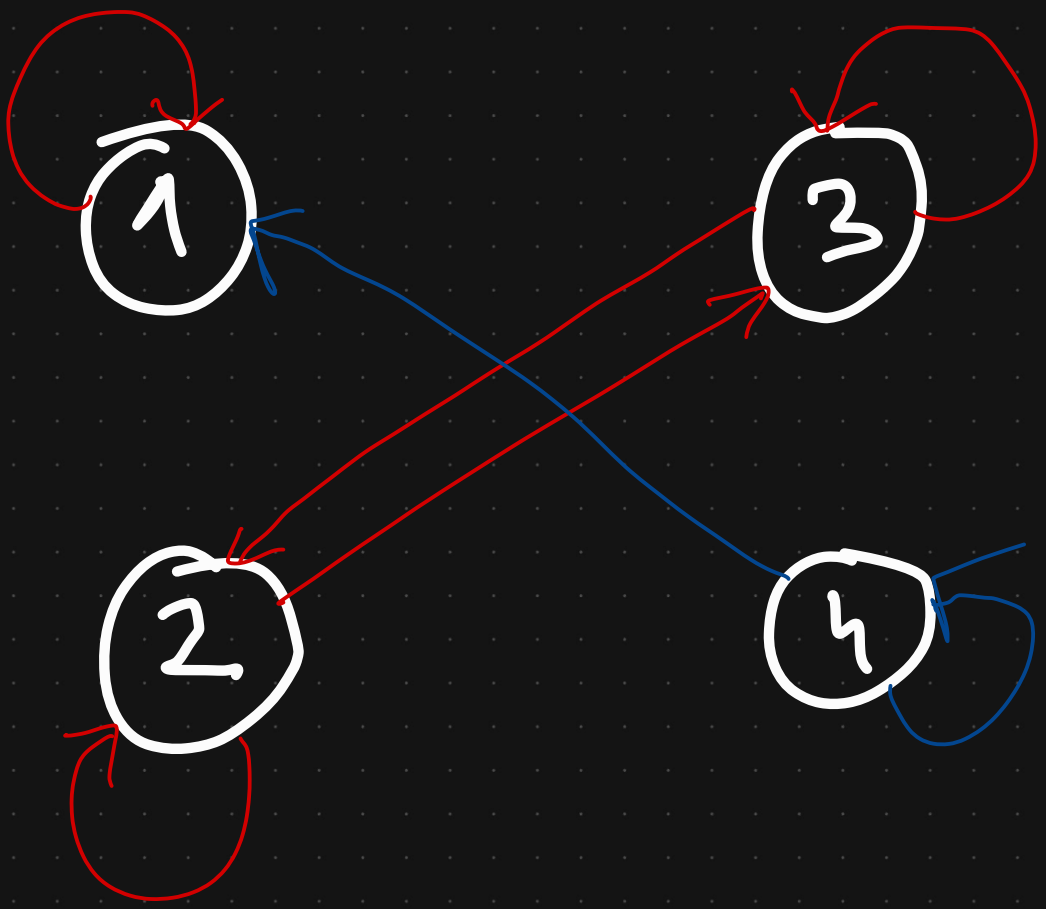
{1,3}
↓
1
Aperiodic

{1,2,4}
↓
1

{2,3,4}
↓ ↓
2 2

not irreducible

K3



{1,3}, {2,4} {2,3}

1 1 2

Not irreducible

K → Doubly stochastic $P(T_x < \infty) = 1$ ✓

$\pi(x) = \frac{1}{n}\ \forall x$ $\quad E[T_x] < \infty$ ✓

Pos. Recc.

$$\begin{bmatrix} 0 & 0.5 & 0 & 0.5 \\ 0.5 & 0 & 0.5 & 0 \\ 0 & 0.5 & 0 & 0.5 \\ \vdots & & & \end{bmatrix} \quad \{S\}$$

↓

2 period

$P(T_1 < \infty) = 1$

$$E[T_1] = 1\frac{1}{2}\cdot\frac{1}{2} + 2\frac{1}{2}\frac{1}{2} + 3\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2} + \dots$$

$$= \sum_{m=1}^{+\infty} \frac{m}{2^{2m}} = < \infty$$

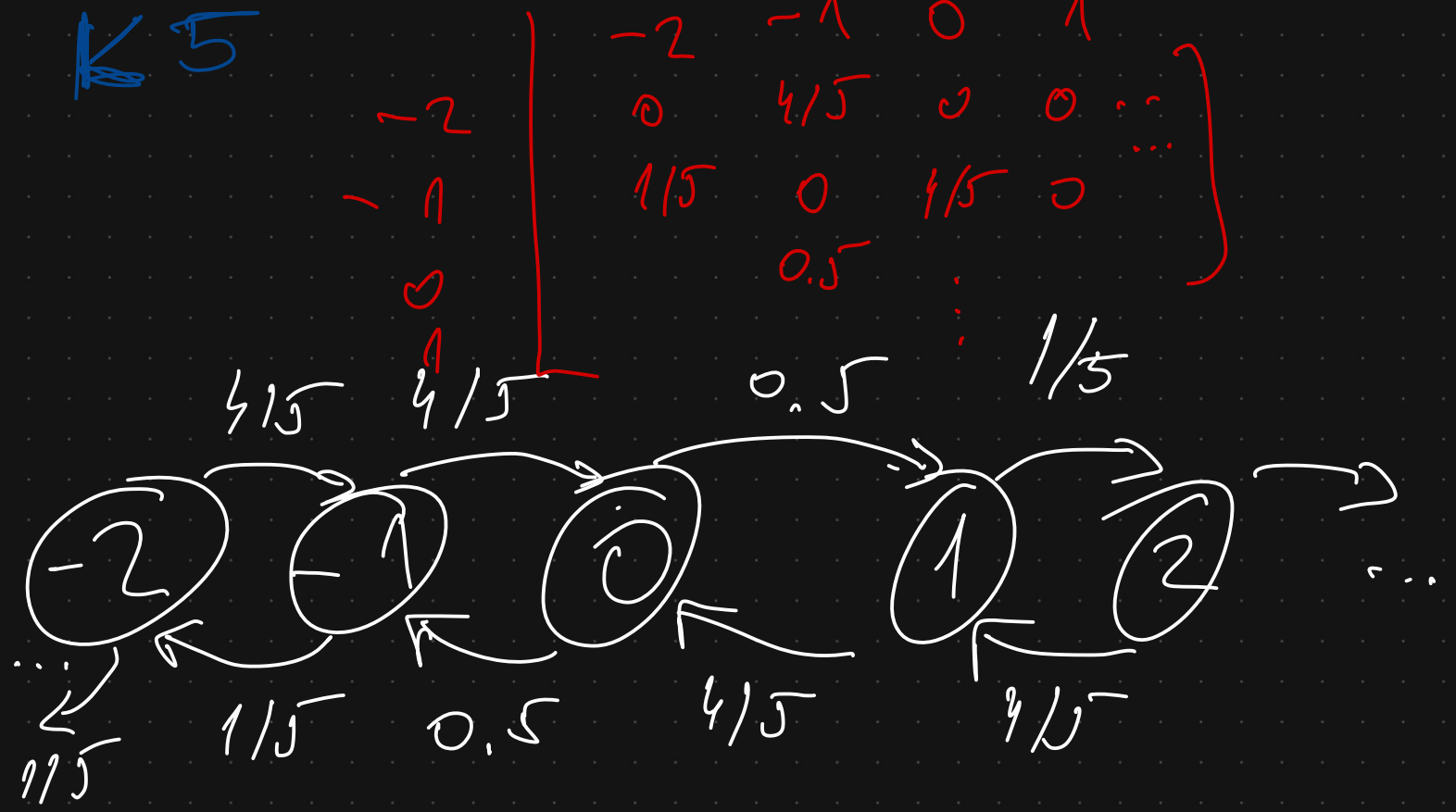
$$P(T_1 < \infty) = \frac{1}{2}\cdot\frac{1}{2} + \frac{1}{2}\cdot\frac{1}{2} + \frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2} + \dots$$

$$= \frac{1}{4} + \frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \dots$$

$$= 2\sum_{m=1}^{\infty} \frac{1}{2^{2m}} = \frac{1}{4} + \frac{1}{2^4} + \frac{1}{2^6} < \infty$$

↓ 2^4 ↓ 2^6

K5



Approx

	-2	-1	0	1	2
-2	1/5	4/5	0	0	0
-1	1/5	0	4/5	0	0
0	0	0.5	0	0.5	0
1	0	0	4/5	0	1/5
2	0	0	0	4/5	1/5

$$E[T_1] = \quad + \frac{1}{5}\cdot\frac{4}{5}\cdot 2 + \frac{1}{5}\cdot\frac{1}{5}\cdot\frac{4}{5}\cdot\frac{4}{5}\cdot 3$$