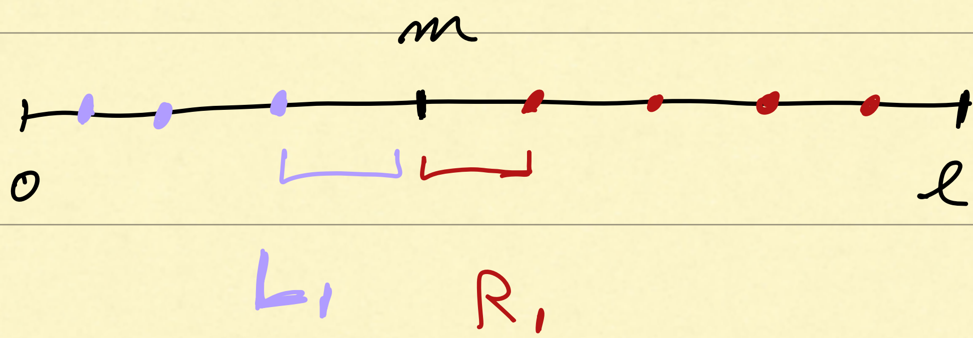
PS4



i) # successes

$\Delta t \leftrightarrow$ Length m

$i=0$

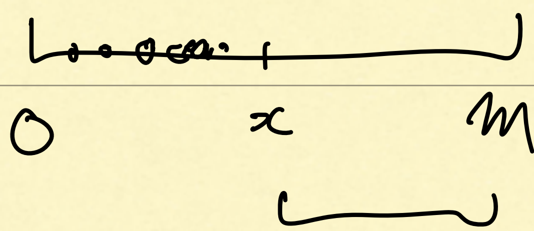
$$\mathbb{P}(i=0) = e^{-\lambda m}$$

checks

$\lambda \to \infty$, $\mathbb{P} \to 0$

$m \to 0$, $\mathbb{P} \to 1$

ii) $L_1 < x$

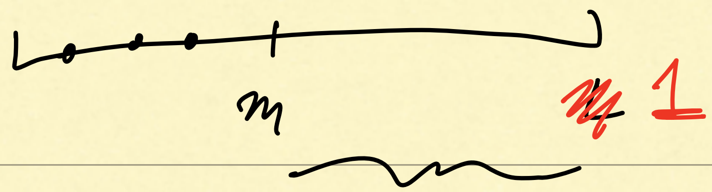


$$\text{"}\Delta T\text{"} = m - x$$

$$\mathbb{P}(L_1 < x) = e^{-\lambda(m-x)}$$

$$0 < x < m$$

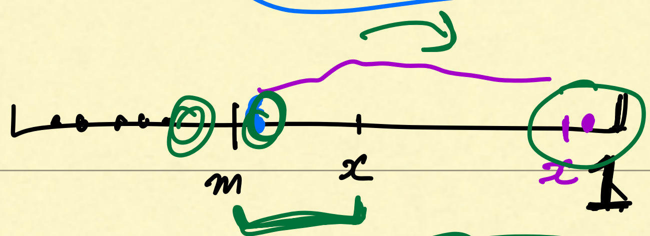
iii)



$$\mathbb{P}(R_1 = 1) = e^{-\lambda(1-m)}$$

As $x \to m$, $\mathbb{P} \to 1$ ✓

iv)



$$\mathbb{P}(R_1 > x) \overset{?}{=} e^{-\lambda(1-x)}$$ ✗

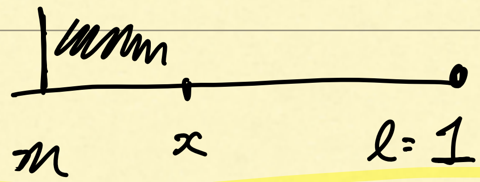
CHECK

~~$x \to 1$, $\mathbb{P} \to 0$~~ ☆

$\lambda \to \infty$ $\mathbb{P} \to 0$

$$\overset{?}{=} e^{-\lambda(x-m)} \times$$

$$\mathbb{P}(R_1 > x) = 1 - \underbrace{\mathbb{P}(R_1 < x)}$$



$$\mathbb{P}(R_1 < x) = 1 - e^{-\lambda(x-m)}$$

J: $\mathbb{P}(R_1 > x) = 1 - e^{-\lambda(x-m)}$ $\times$

CHECK

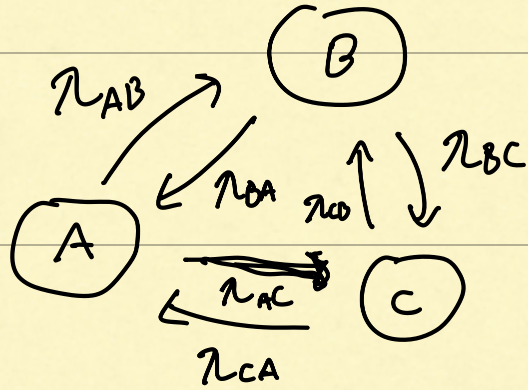
$x \to 1$, $\mathbb{P} \to e^{-\lambda(1-m)}$

(FROM iii)

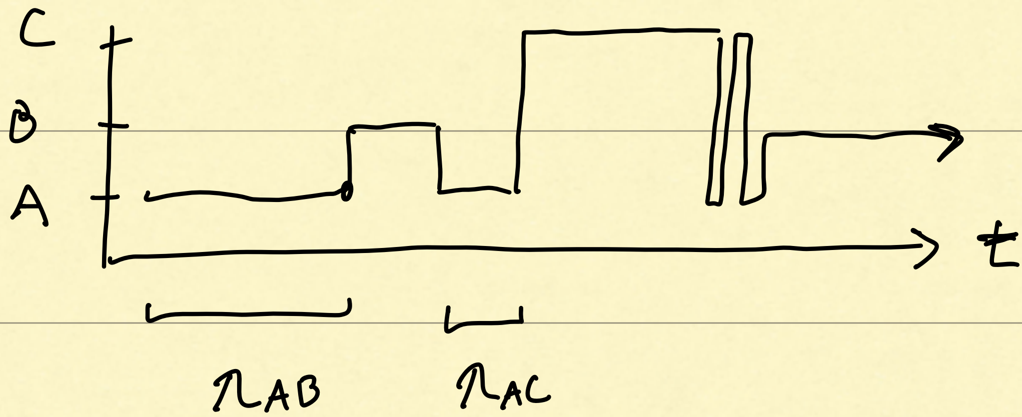
JUN

$$\mathbb{P}(R_1 > x) \overset{?}{=} e^{-\lambda(x-m)}$$

CONTINUOUS-TIME MARKOV CHAIN



A CONTINUOUS-TIME STOCHASTIC PROCESS WITH N STATES, WHERE TRANSITIONS BETWEEN STATES ARE POISSON PROCESSES



$\mathbb{P}_i(t)$ – PROBABILITY IN STATE i AT t

LET $\vec{\mathbb{P}}(t) = \begin{bmatrix} \mathbb{P}_1 \\ \vdots \\ \mathbb{P}_N \end{bmatrix}(t)$

$$\frac{d}{dt}\vec{\mathbb{P}}(t) = \underline{\underline{M}} \cdot \vec{\mathbb{P}}(t)$$

↖ TRANSITION MATRIX

$$\underline{\underline{M}} = \begin{bmatrix} -\sum^{i} \lambda_{1\to i} & & \lambda_{N\to 1} \\ \lambda_{1\to 2} & & \\ & & \\ \lambda_{1\to N} & & \end{bmatrix}_{N\times N}$$

COLUMNS SUM TO ZERO