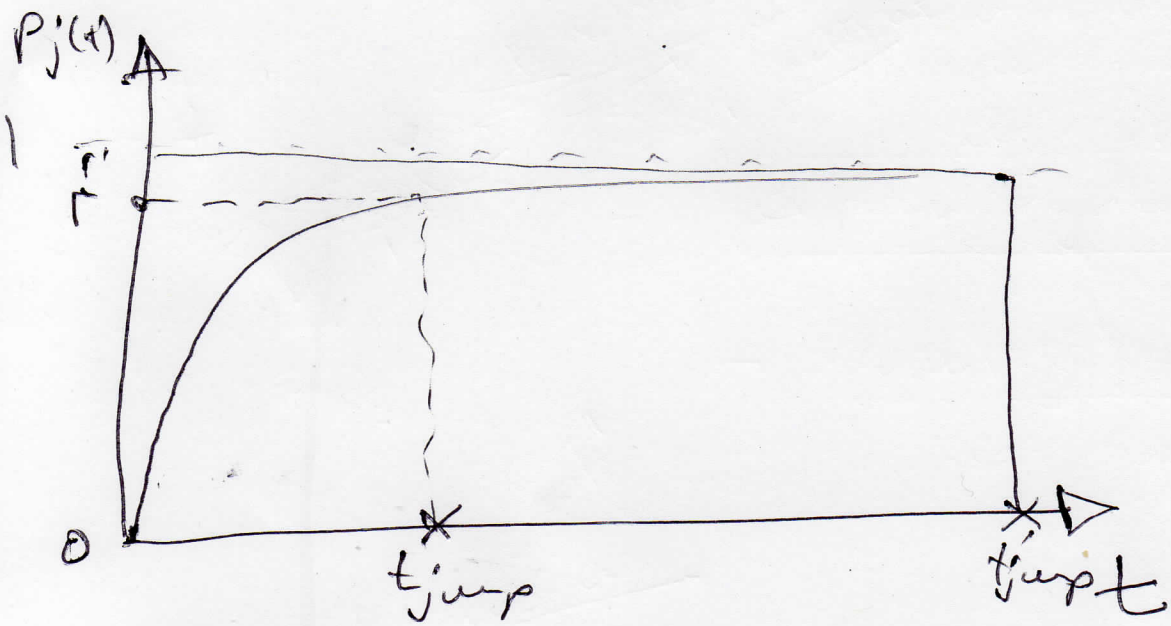
$$\partial_t \begin{pmatrix} h \\ p \end{pmatrix} = -k \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} h \\ p \end{pmatrix} + k \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} h \\ p \end{pmatrix}$$

~~jump time distribution~~

jump probability

$$P_j(t) = -e^{-kt} + 1 = 1 - e^{-kt}$$

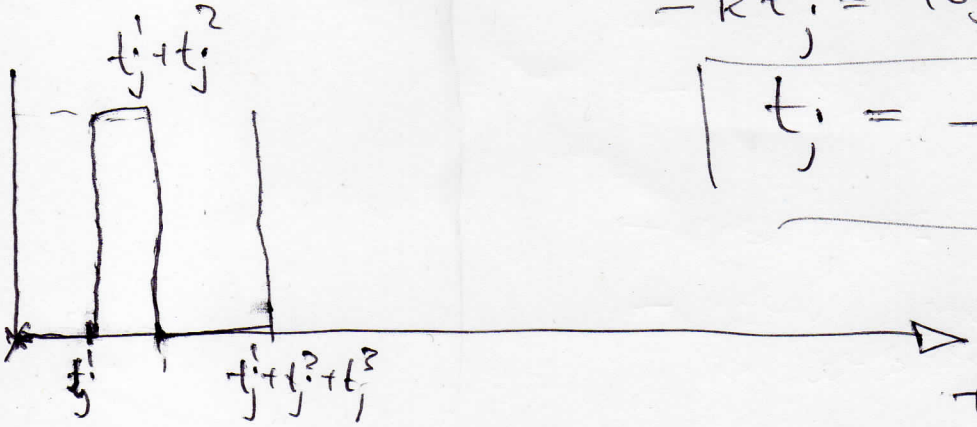


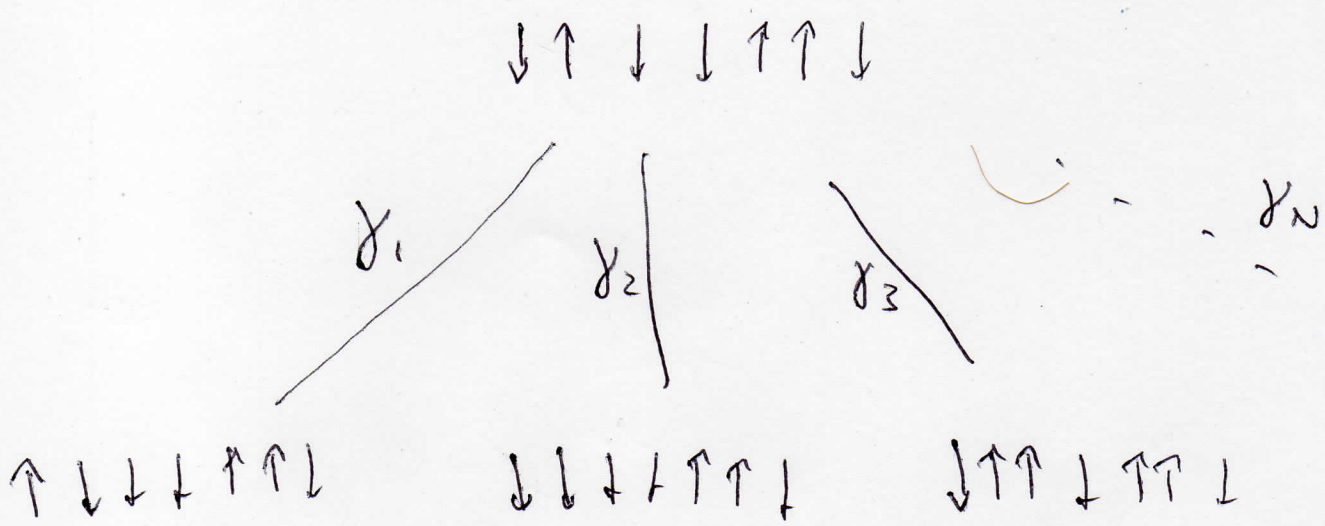
$$P_j(t) = r = 1 - e^{-k t_j}$$

$$\hookrightarrow \quad e^{-k t_j} = 1 - r$$

$$\hookrightarrow \quad -k t_j = \log(1-r)$$

$$\boxed{t_j = -\frac{\log(1-r)}{k} = -\frac{\log r'}{k}}$$





1) determine jump time

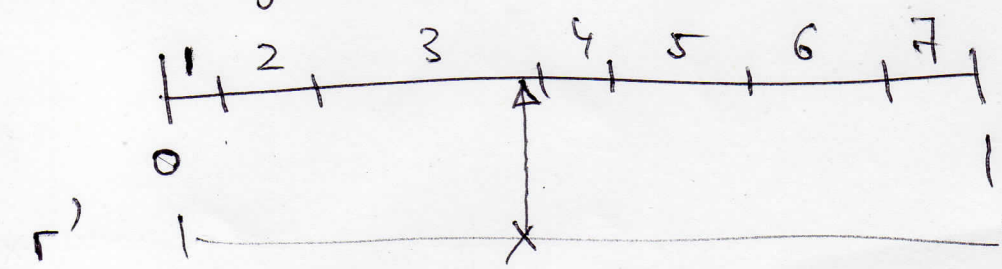
$$P_j(t) = 1 - \exp\left(\sum_{j=1}^{N} \gamma_j\right) t$$

$$\hookrightarrow t_{jump} = -\frac{\log r}{\sum_{j=1}^{N} \gamma_j}$$

2) which atom changes state?

$$\left\{\gamma_1, \gamma_1+\gamma_2, \gamma_1+\gamma_2+\gamma_3, \ldots, \gamma_1+\ldots+\gamma_N\right\} \Big/ \sum_{j=1}^{N} \gamma_j$$

$$\left\{\frac{\gamma_1}{\sum_{j=1}^{N}\gamma_j}, \ldots, 1\right\}$$



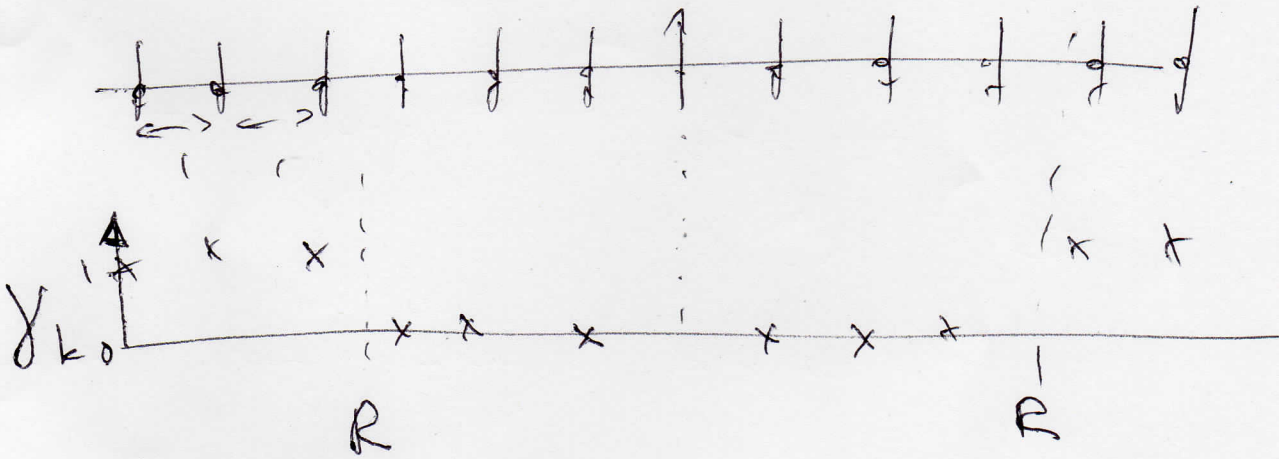
$\hookrightarrow$ jump #3 takes place

3) repeat

rate for k-th to flip

$$\gamma_k = \frac{1}{1 + R^{12}\left(\sum_{j\neq k}^{N} \frac{n_j}{|j-k|^6}\right)^2}$$

$$n_k = \begin{cases} 1 & \text{if atom } k \text{ is in state } \uparrow \\ 0 & \text{otherwise} \end{cases}$$



$$\Delta_k \to \Delta_k + \sum_{k\neq j}^{N} \frac{C_6\, n_j}{|k-j|^6}$$