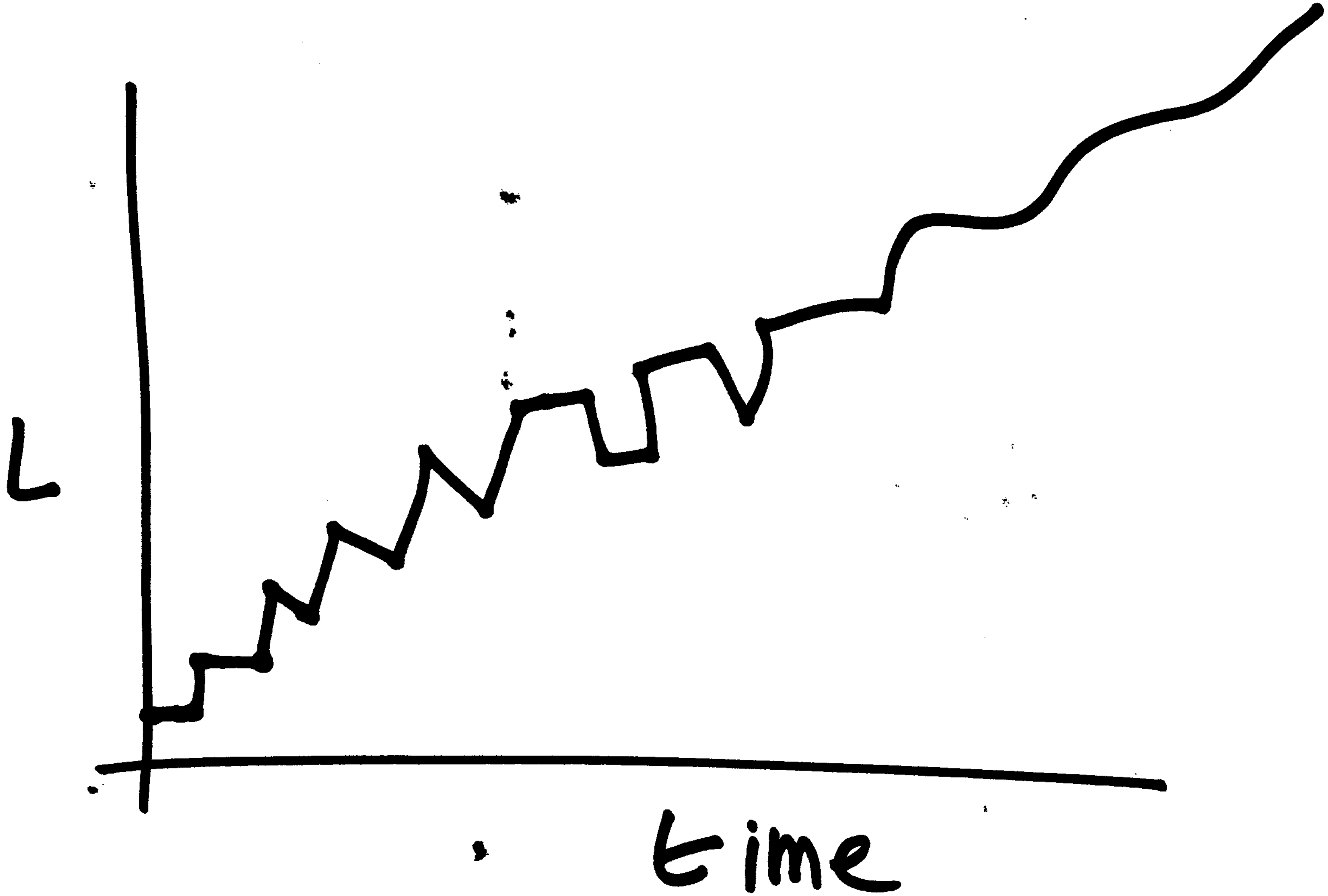
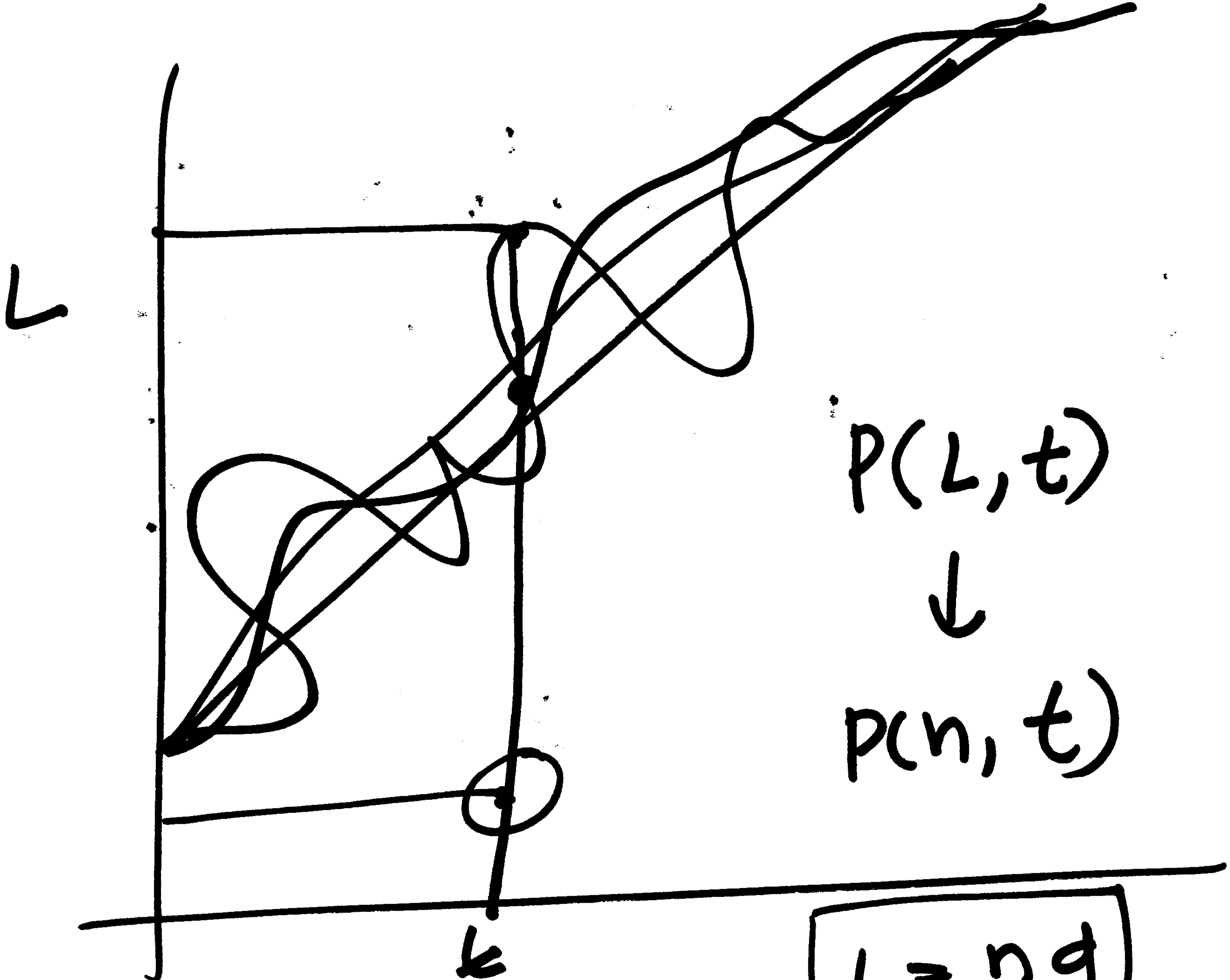
Prof- Ranjith.
Lec-30
Date - 18/11/1[illegible]



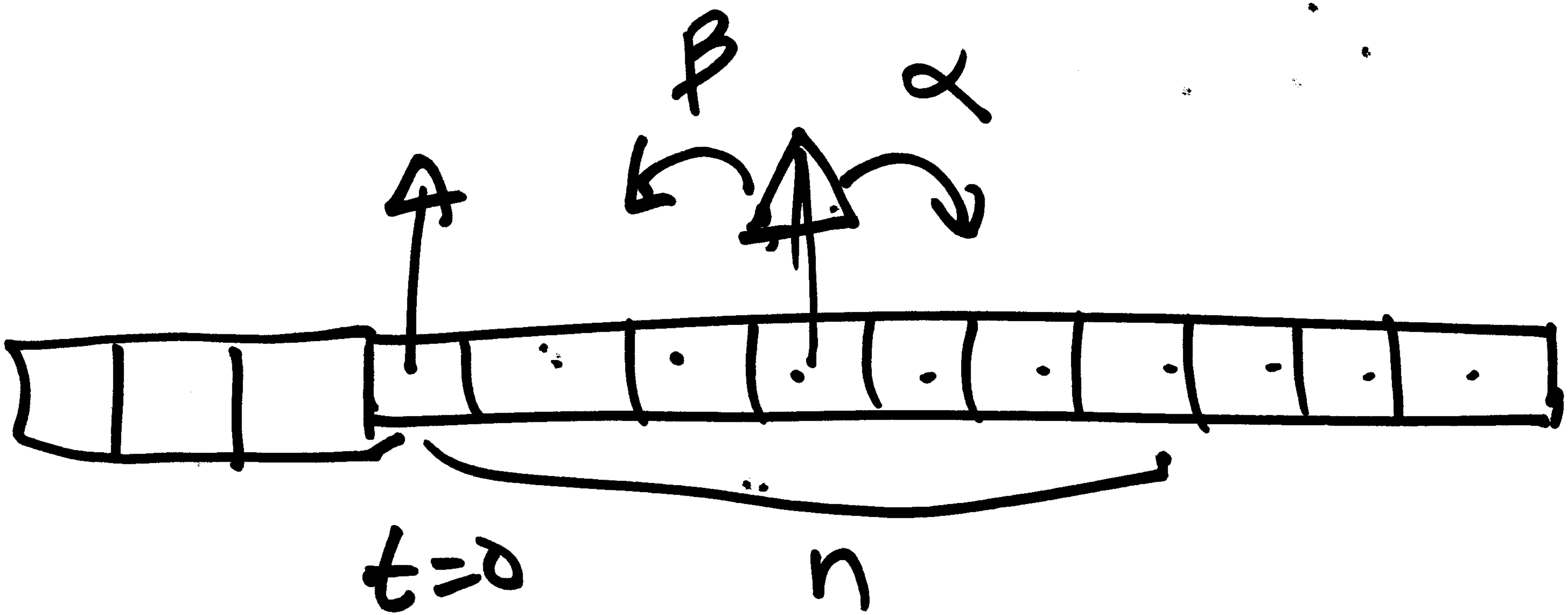


$$P(L, t)$$

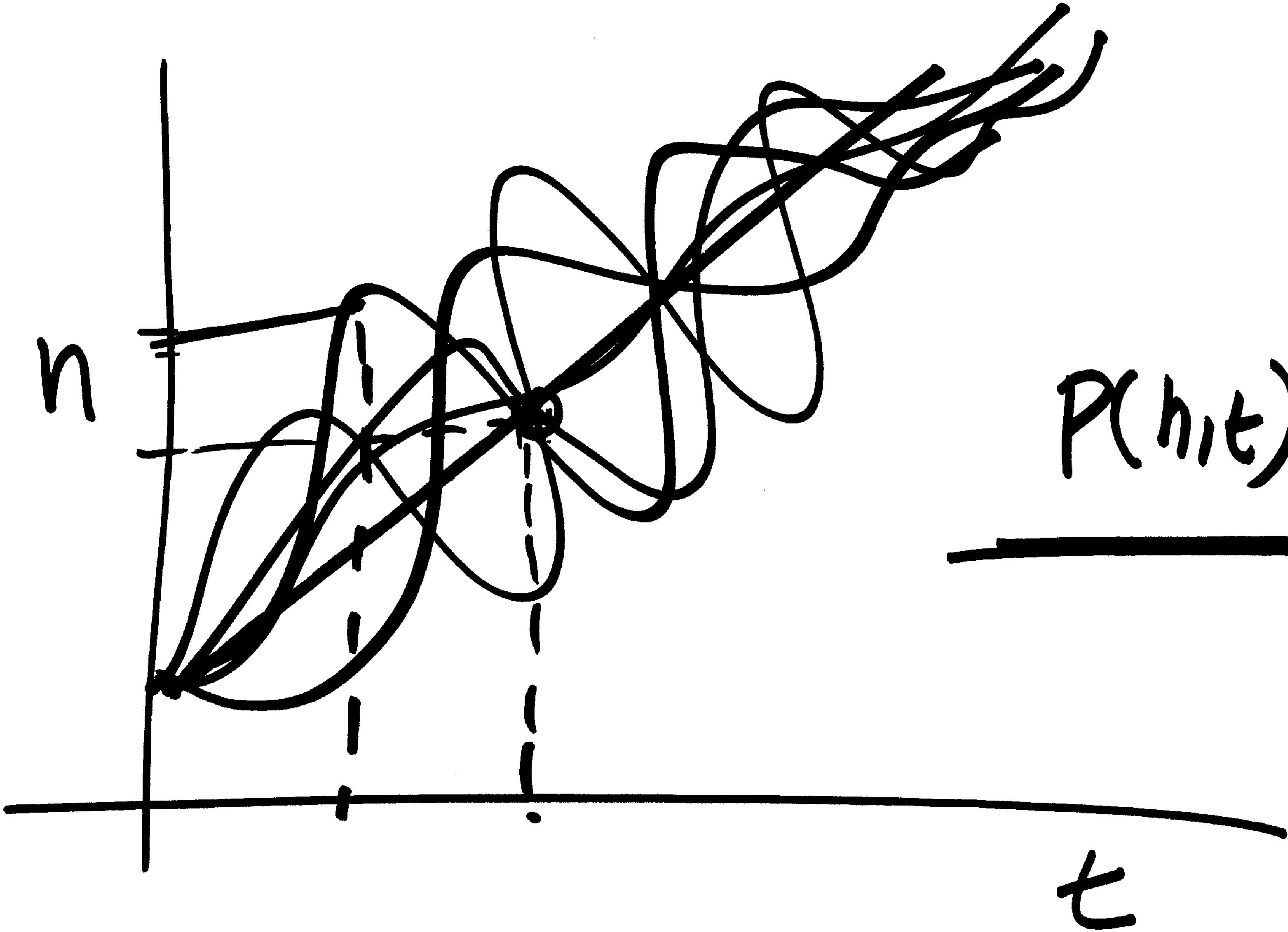
$$\downarrow$$

$$P(n, t)$$

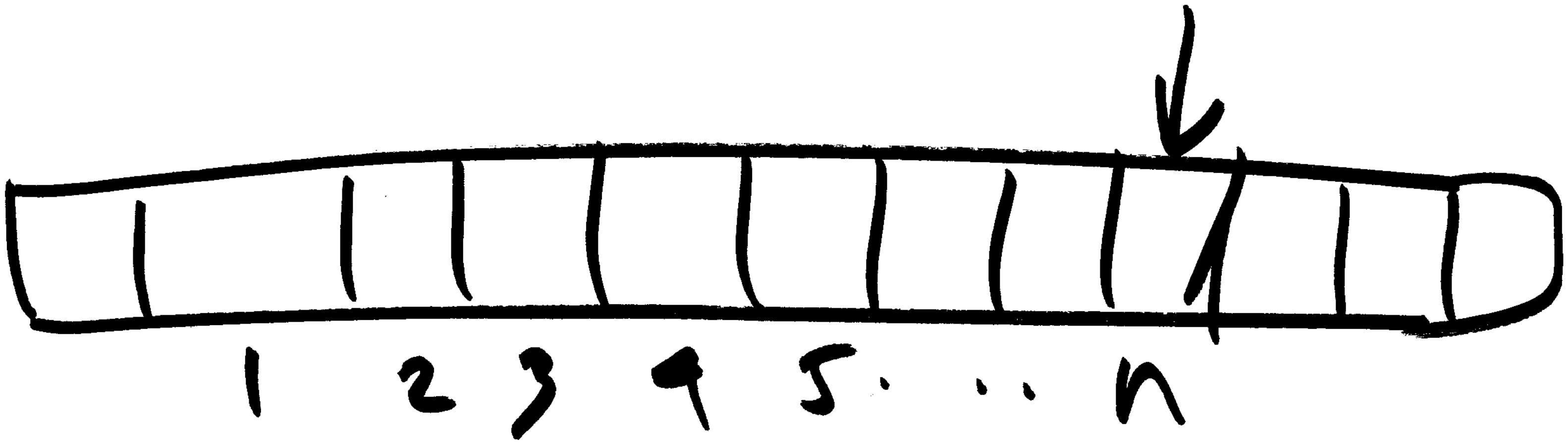
$$\boxed{L = n\underline{d}}$$



$P(n,t)$



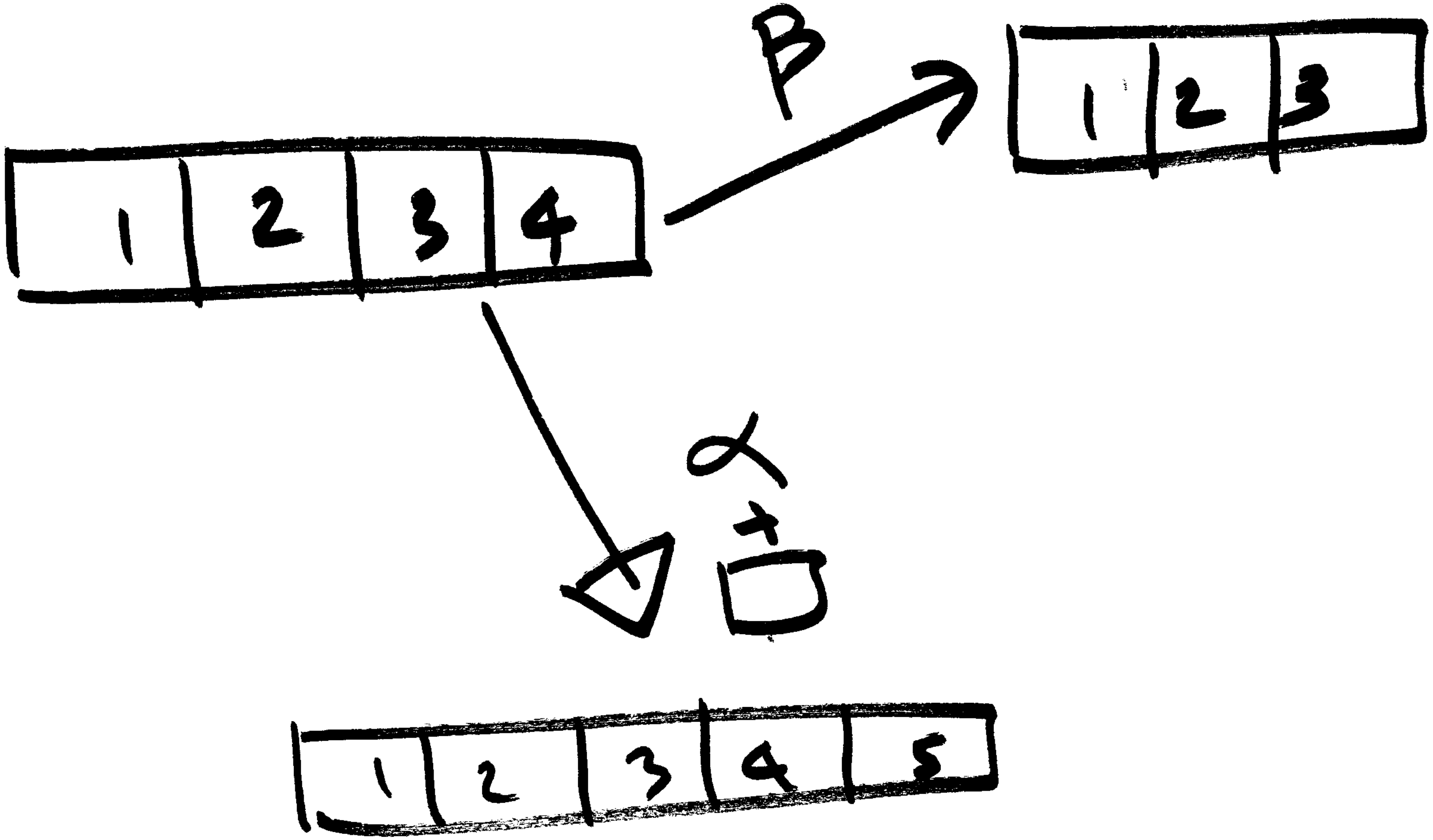
$P(n,t)$



$P(n,t)$

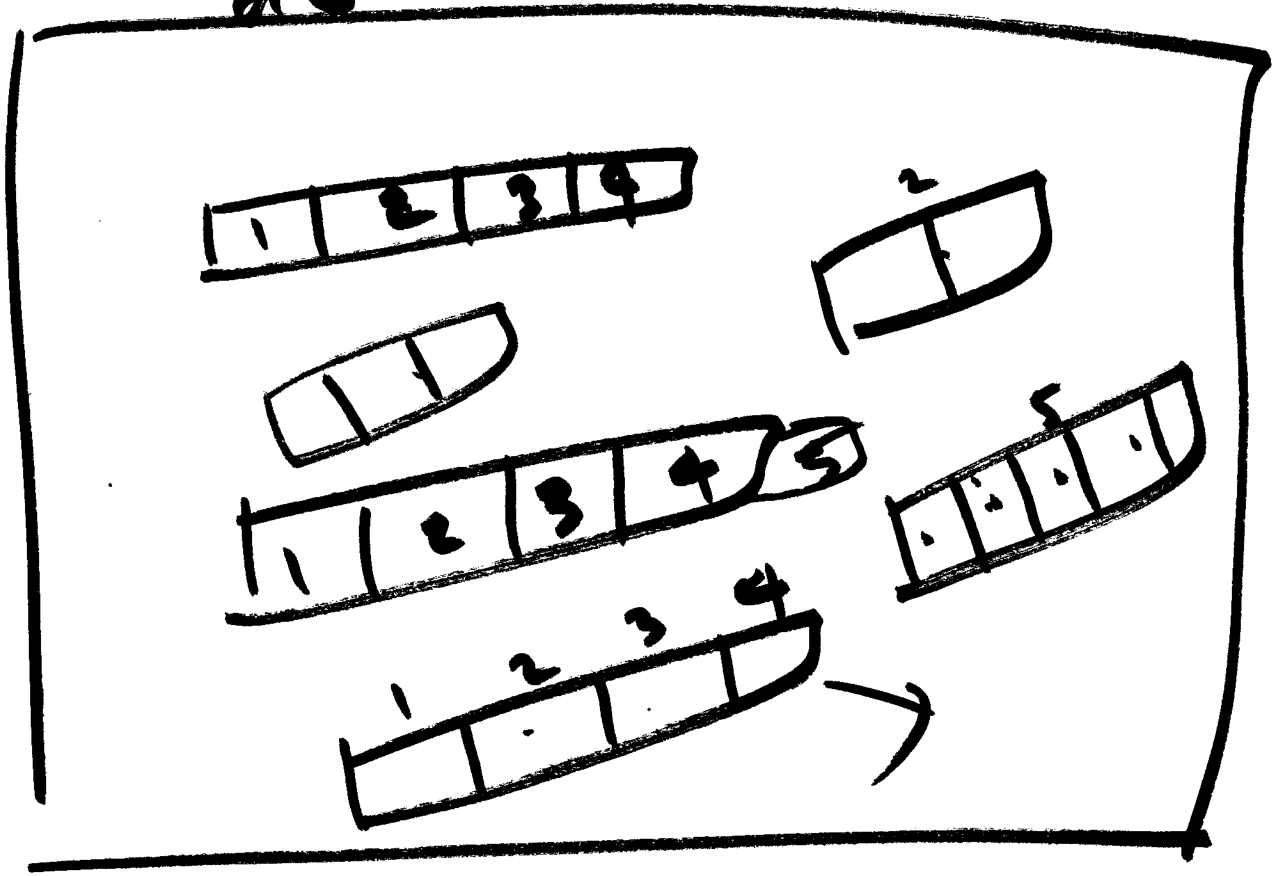
$$\frac{dP(n,t)}{dt} = ?$$

Master equation



$$\frac{dP(4,t)}{dt} = -\left[\alpha P(4,t) + \beta P(4,t)\right]$$

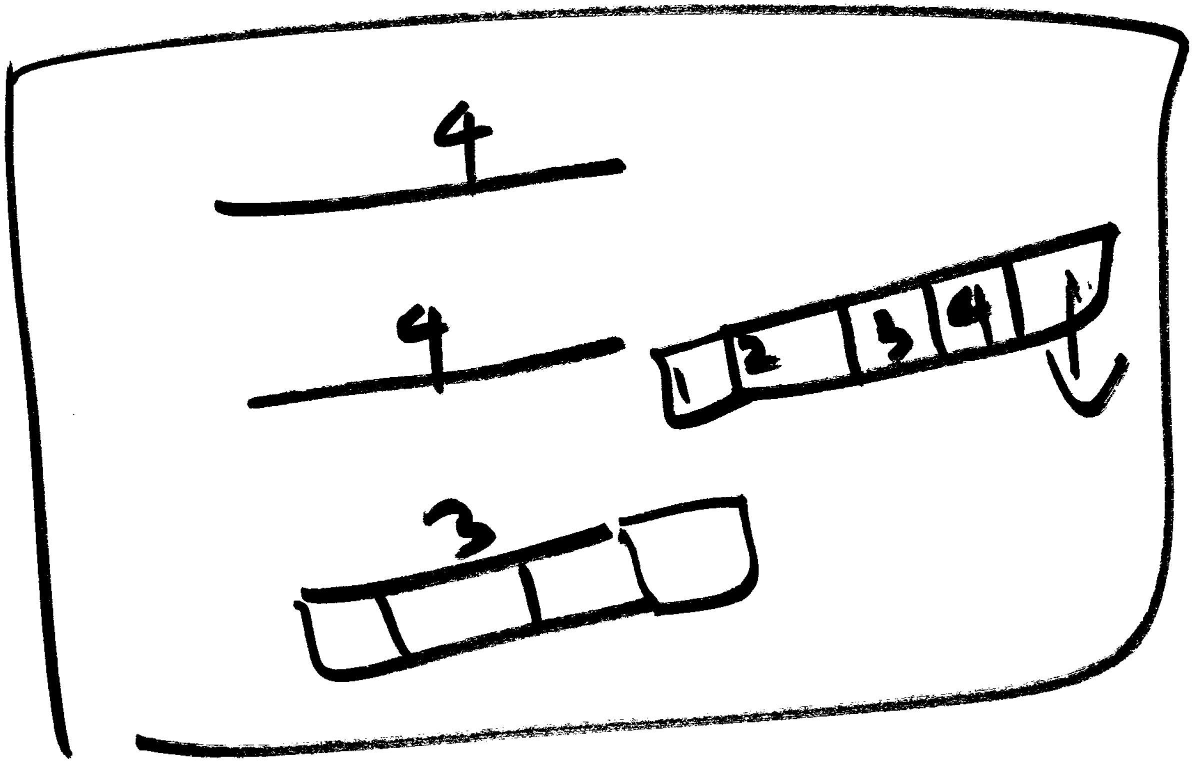
$$\frac{dP(4)}{dt} = -\left[\beta P(4)\right] - \alpha P(4)$$



$$P(4) = \frac{3}{6} = \frac{1}{2} = 0.5$$

$$\frac{dP(n)}{dt} = -\alpha P(n) - \beta P(n) + \left(\alpha P(n-1) + \beta P(n+1)\right)$$

$$\frac{dP(4)}{dt} = +\alpha P(3) + \beta P(5)$$



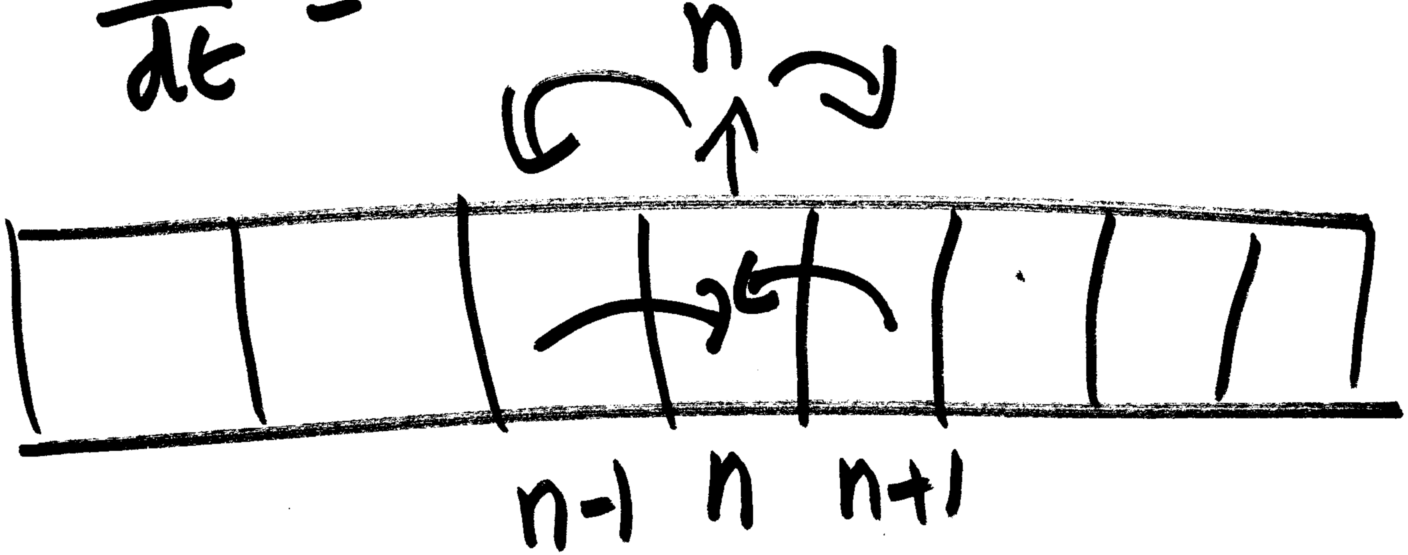
$P(4) \nearrow$ if

$$\frac{dP_n}{dt} = \alpha P_{n-1} + \beta P_{n+1}$$

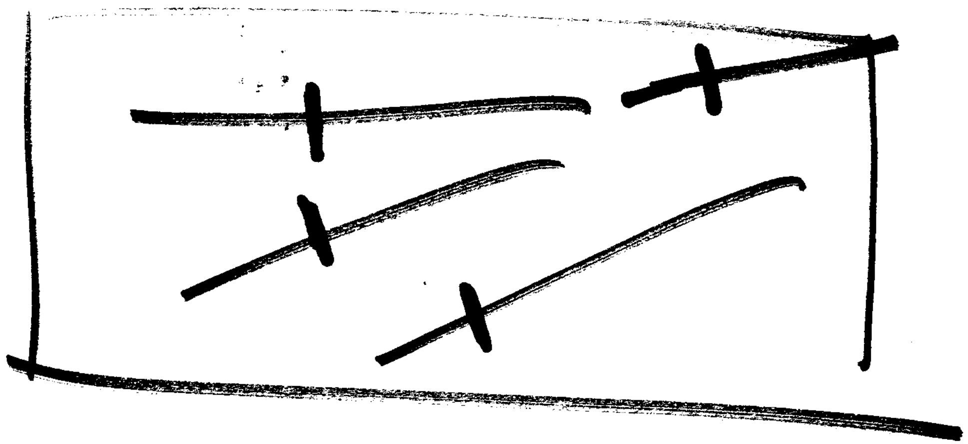
$$- \alpha P_n - \beta P_n$$

$$P_n = P(n)$$

$$\frac{dP_n}{dt} =$$



$$\frac{dP_n}{dt} = \alpha P_n - \beta P_n$$



$$\tilde{f}(k) = \int f(x)\, e^{ikx}\, dx$$

$$\boxed{\tilde{f}(k) = \int f(x)\, e^{-kx}\, dt}$$

$$\boxed{\tilde{p}(k,t) = \sum_n \underline{P(n,t)}\, e^{-kn}}$$

$$= P(0,t)\,e^{-k\times 0} + P(1,t)\,e^{-k\cdot 1} + P(2,t)\,e^{-2k} + P(3,t)\,e^{-3k} + \cdots$$

$$\frac{d}{dt}\underbrace{\sum_n P(n,t)e^{-kn}} = \alpha\sum_n P(n-1,t)e^{-kn} + \beta\sum_n P(n+1,t)e^{-kn} - \alpha\sum_n \underbrace{P(n,t)e^{-kn}} - \beta\sum_n \underbrace{P(n,t)e^{-kn}}$$

$$\downarrow$$

$$\frac{d}{dt}\left[\tilde{P}(k,t)\right]$$

$$\frac{d}{dt}\tilde{p}(k,t) = -(\alpha+\beta)\,\tilde{p}(k,t)$$

$$+\,\alpha \sum_{n=} \underline{p_{n-1}}\, e^{-kn}$$

$$+\,\beta \sum_{n} p_{n+1}\, e^{-kn}$$

$$m = n-1$$
$$n = m+1$$

$$\propto \boxed{\sum_m P_m e^{-km}} \, e^{-k} \longrightarrow \tilde{P}(k)$$

$$\uparrow$$

$$\propto \sum_m P_m e^{-k(m+1)}$$

$$\uparrow$$

$$\beta \sum_n p_{n+1} e^{-kn}$$

$n+1 = m$

$n = m-1$

$$\beta \sum_m p_m e^{-k(m-1)}$$

$$= \beta \underbrace{\sum_m p_m e^{-km}}_{\tilde{p}(k)} \cdot e^{k}$$

$$\frac{d\tilde{P}(k)}{dt} = -(\alpha+\beta)\tilde{P}(k) + \alpha\tilde{P}(k)e^{-k} + \beta\tilde{P}(k)e^{k}$$

$$= \cancel{\alpha}\,\tilde{P}(k)\left[(e^{-k}-1)\alpha + (e^{k}-1)\beta\right]$$

$$\frac{d\tilde{p}}{dt} = \sigma \mu(k) \tilde{p}$$

$$\frac{dy}{dt} = \mu y$$

$$y = Ae^{mt}$$

$$\sum_n P(n,t) = 1$$

$$\tilde{P}(k,t) = \sum_n P(n,t)\, e^{-kn}$$

$$\tilde{P}(0,t) = \sum_n P(n,t) = 1$$

$$\tilde{p}(0,t) = A = 1$$

$$\Rightarrow A = 1$$

$$\tilde{P}(k,t) = \sum_n P(n,t)\, e^{-kn}$$

$$-\frac{\partial}{\partial k}\tilde{P}(k,t) = -\frac{\partial}{\partial k}\sum_n P(n,t)\, e^{-kn}$$

$$= +\sum_n n\, P(n,t)\, e^{-kn}$$

$$-\frac{\partial}{\partial k}\tilde{p}(k,t) = \sum_n n\,P(n,t)\,e^{-kn}$$

$$\left[-\frac{\partial}{\partial k}\tilde{p}(k,t)\right]_{k=0} = \sum_n n\,P(n,t) = \langle n \rangle$$

$$\frac{d\langle x\rangle}{dt} = v =$$

$$\frac{d}{dt}\left[-\frac{\partial}{\partial k} \tilde{p}(k) \right]$$

$$U = \alpha - \beta$$