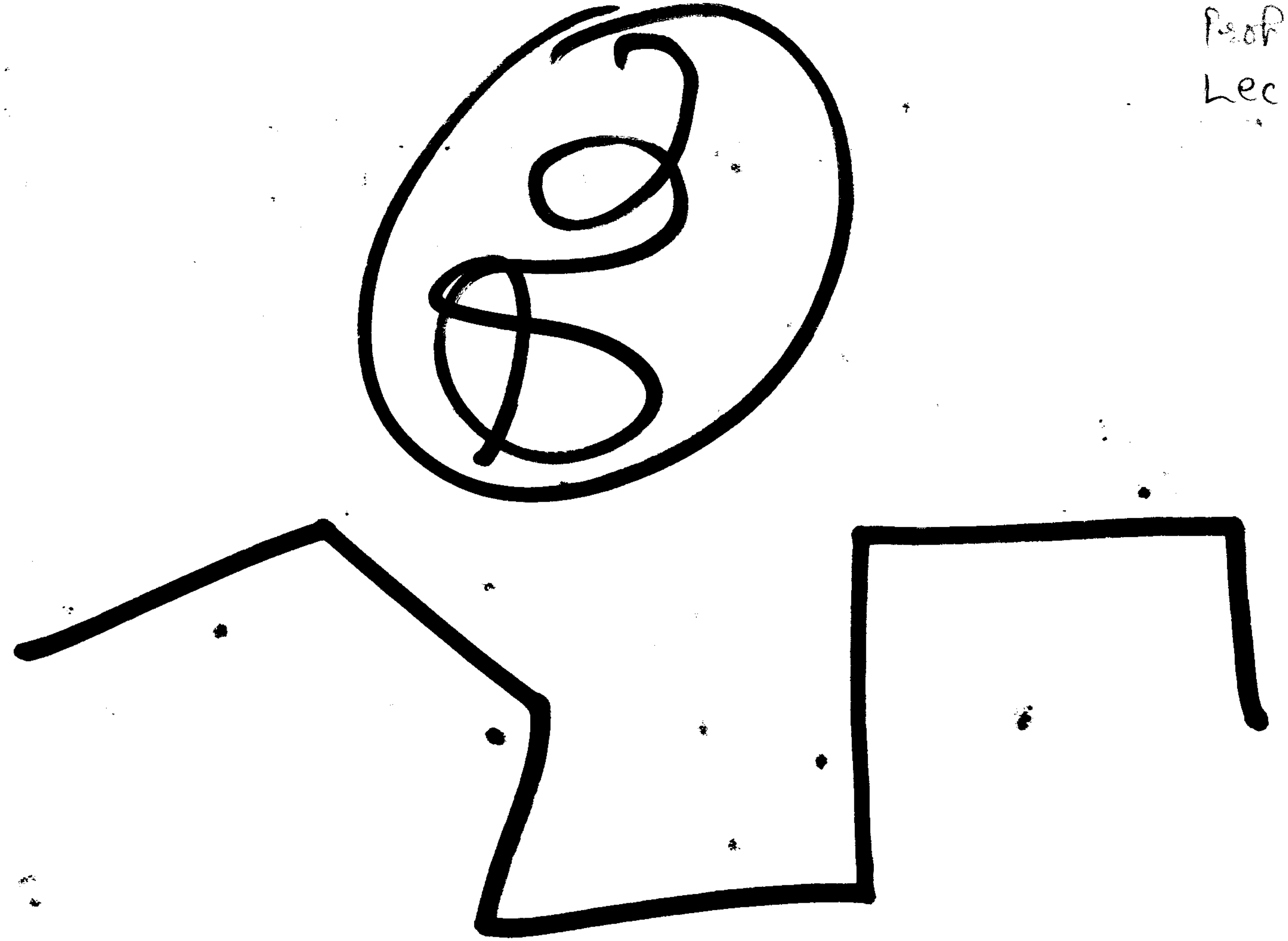
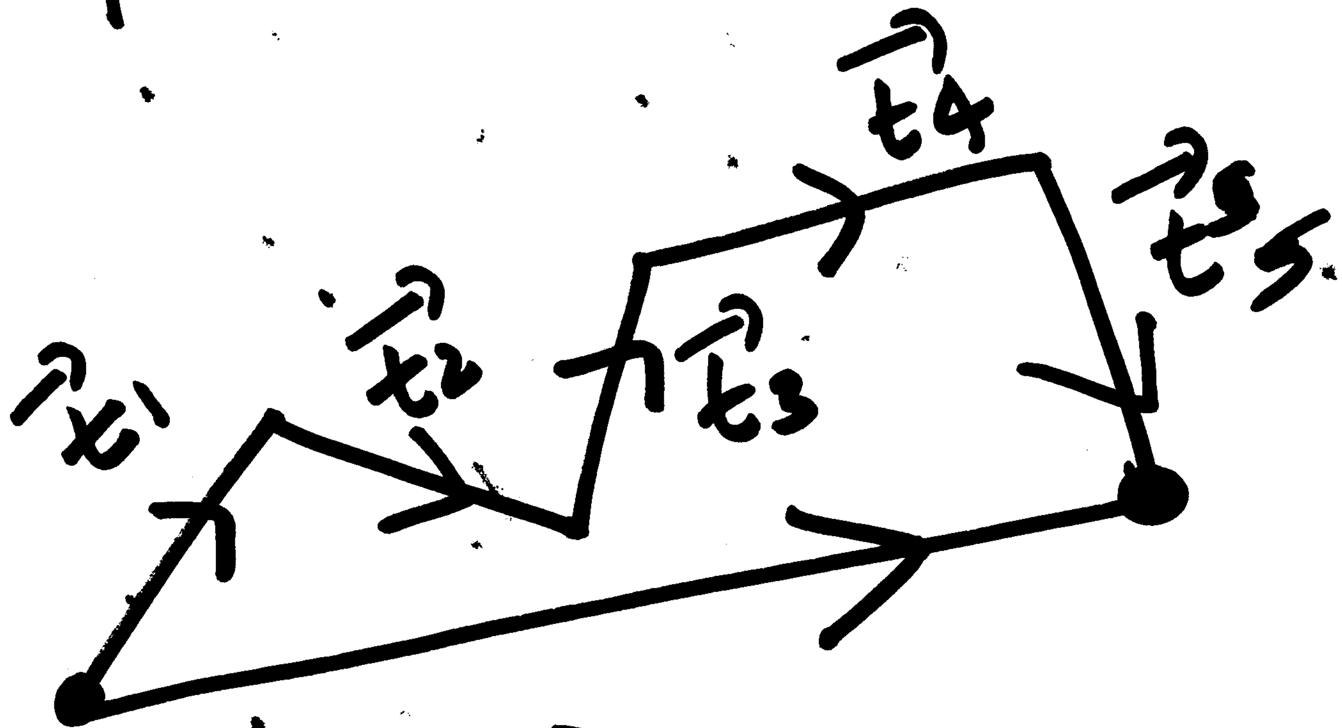
Date - 22/10/11
Prof. Ranjith P.
Lec. 25

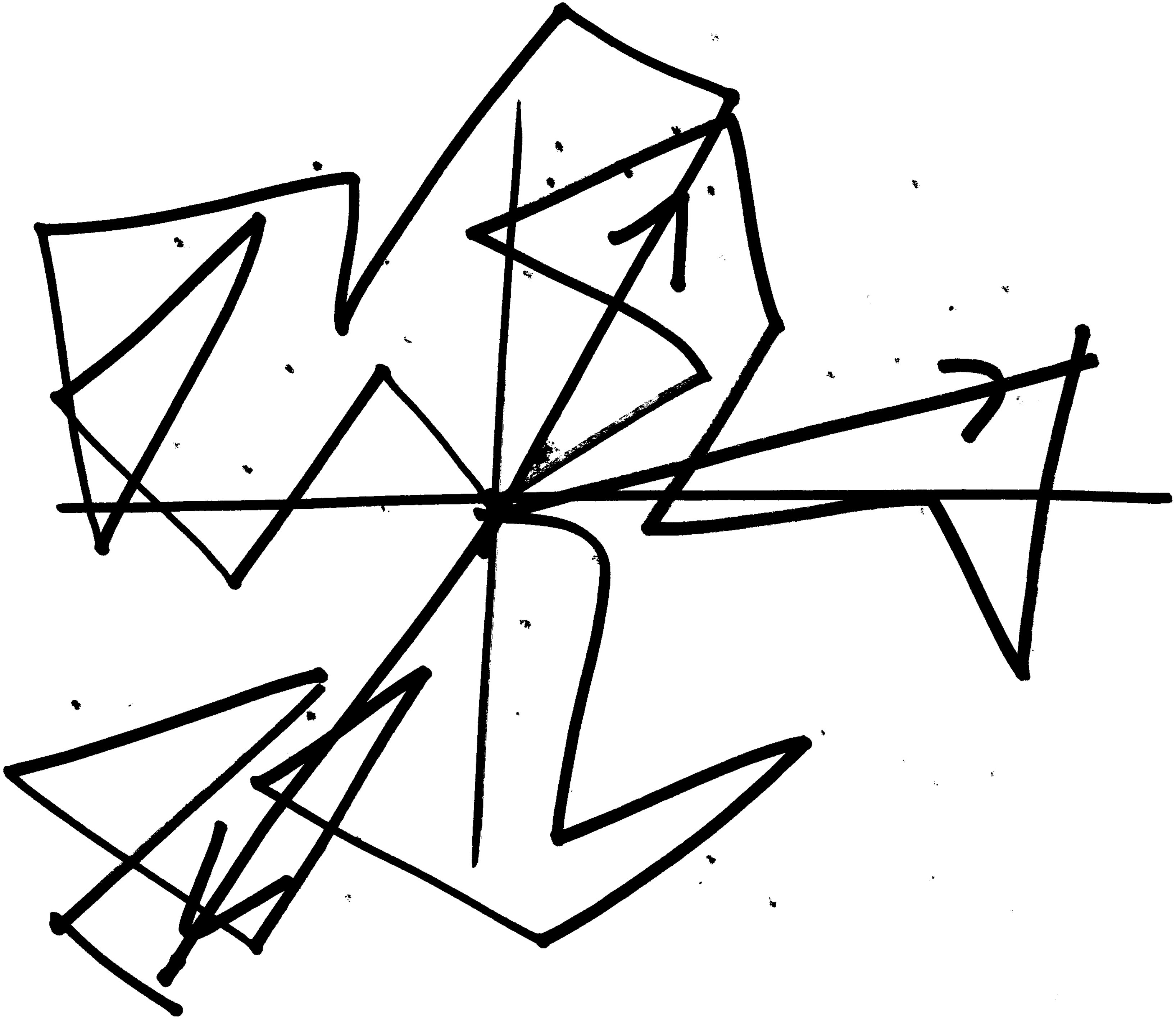


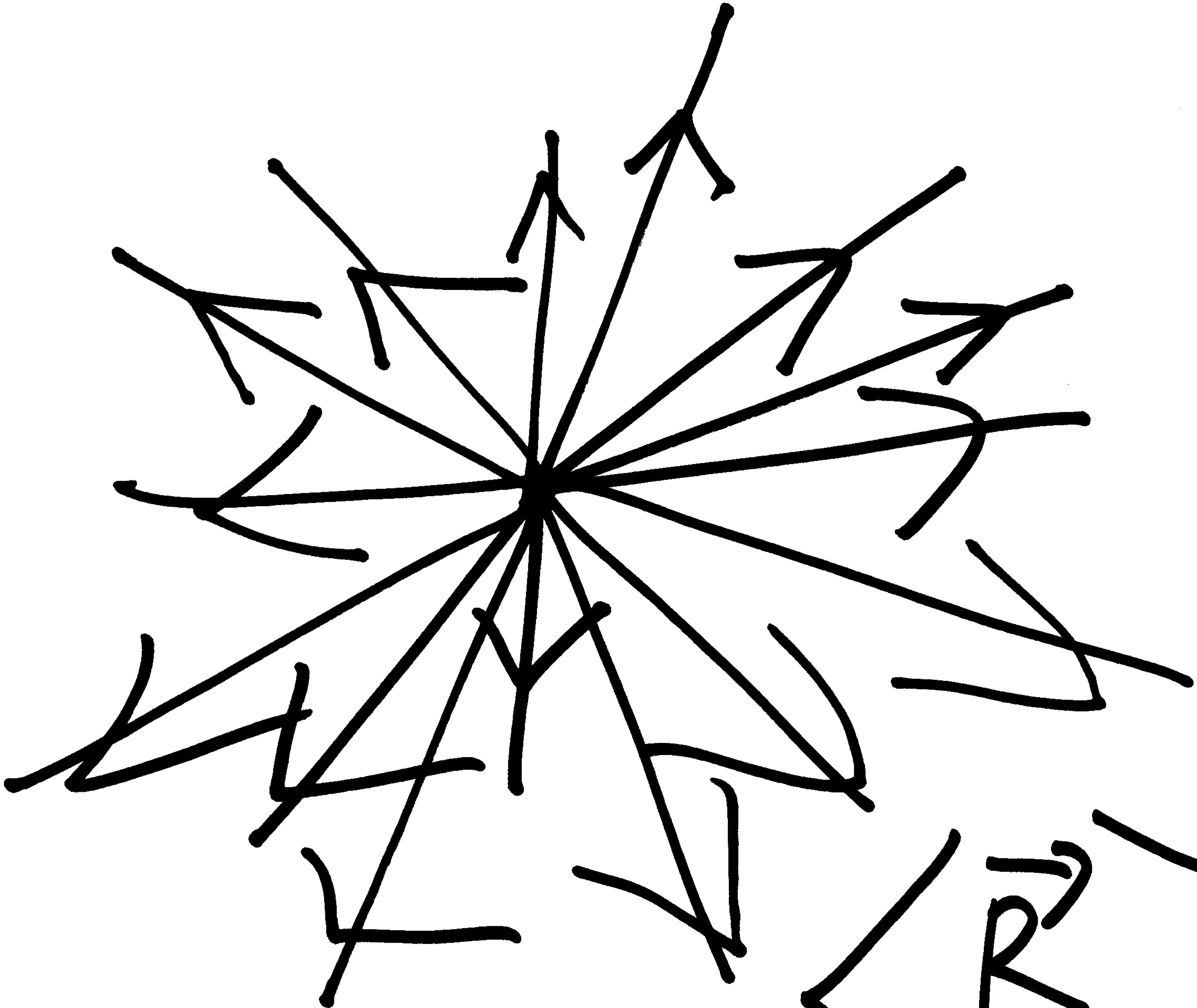
$|\vec{R}|$ = End-to-End distance



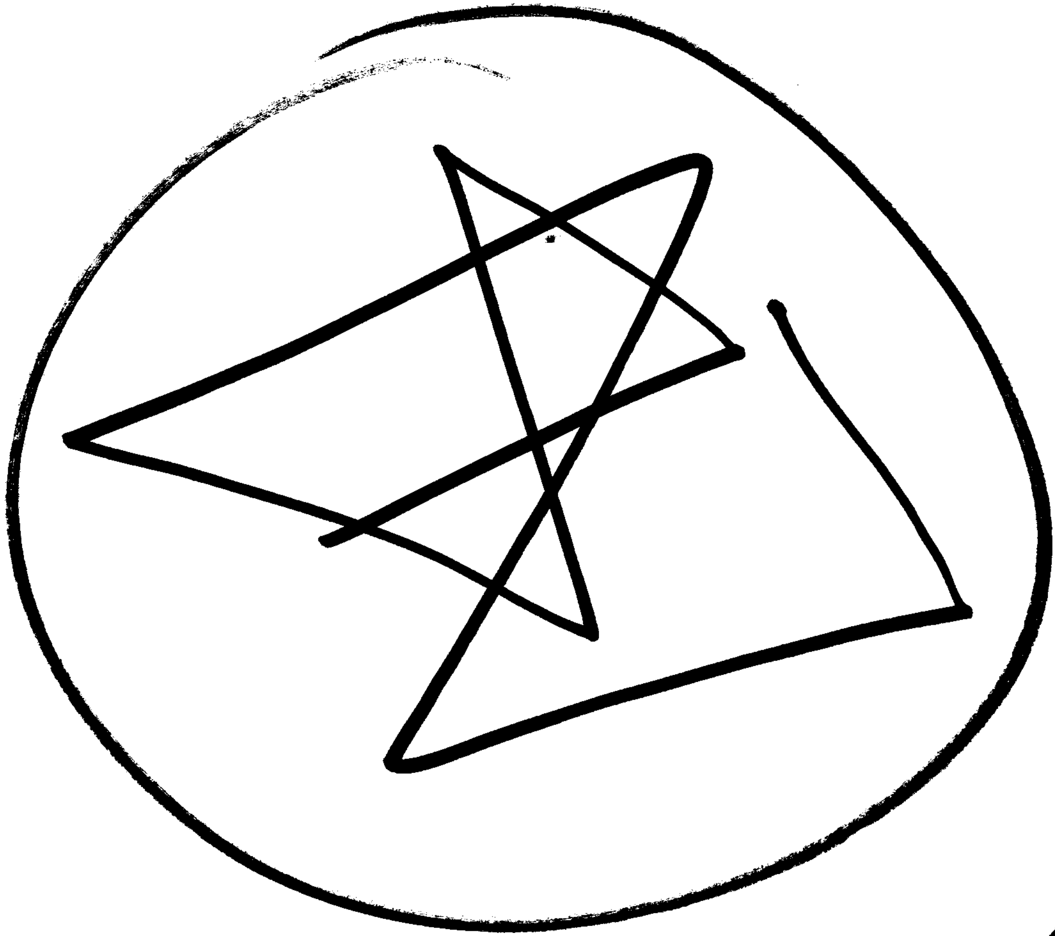
$\vec{R}$

$$\vec{R} = \sum_{i=1}^{5} \vec{t}_i$$





$$\langle \vec{R} \rangle = 0$$



$$\langle R^2 \rangle = ?$$

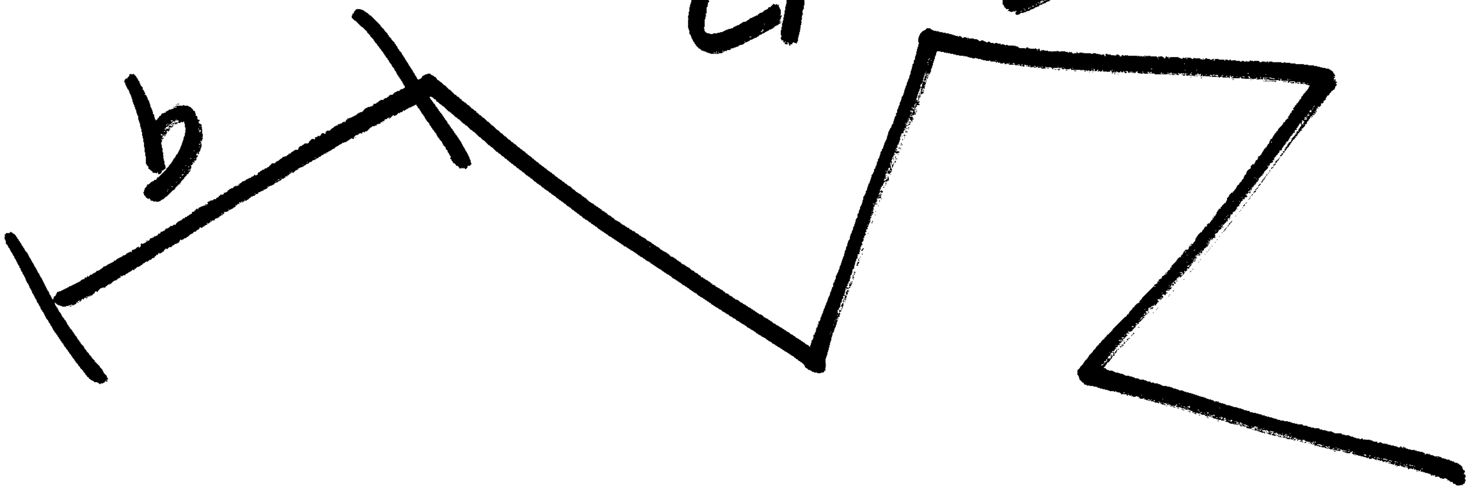
$$\langle \vec{R}^2 \rangle = \left\langle \left(\vec{t_1} + \vec{t_2} + \vec{t_3} + \vec{t_4} + \vec{t_5} \right)^2 \right\rangle$$

$$\left(\vec{R}\right)^2 = \vec{R} \cdot \vec{R}$$

$$\left(\vec{t_1} + \vec{t_2} + \vec{t_3} + \vec{t_4} + \vec{t_5} \right) \cdot \left(\vec{t_1} + \vec{t_2} + \vec{t_3} + \vec{t_4} + \vec{t_5} \right)$$

$|\vec{t}_1| = b$

$t_1^2 = b^2$



$$\left\langle t_1^2 + t_2^2 + \dots t_5^2 + \vec{t}_1 \cdot \vec{t}_2 + \vec{t}_1 \cdot \vec{t}_3 + \dots \vec{t}_1 \cdot \vec{t}_5 + \dots \right\rangle$$

$$= 5b^2 + b^2 \left[\underbrace{\langle \cos\theta \rangle}_{0} + \cdots\cdots \right]$$

$$= \langle 5b^2 \rangle + \langle |t_1| \, |t_2| \cos\theta \rangle +$$

$$\cdots\cdots \langle |t_1| \, |t_5| \cos\theta \rangle + \cdots$$

$$\langle R^2 \rangle = 5b^2$$

$$\sqrt{\langle R^2 \rangle} = \sqrt{5}\, b$$

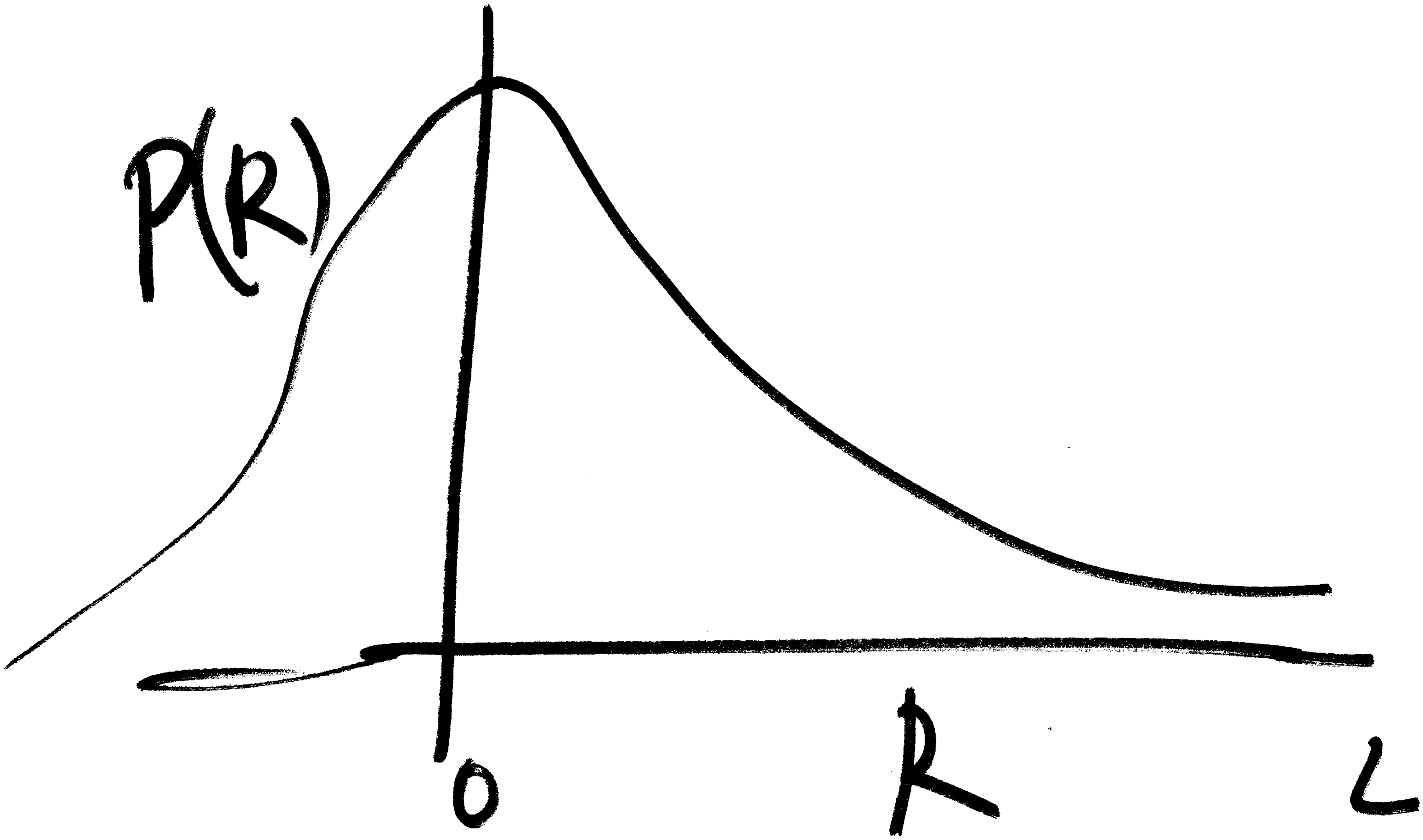
$$= \sqrt{N}\, b$$

$$\langle R \rangle = 0$$

$$\sigma = \sqrt{\langle R^2 \rangle - \langle R \rangle^2} = \sqrt{N}\, b$$

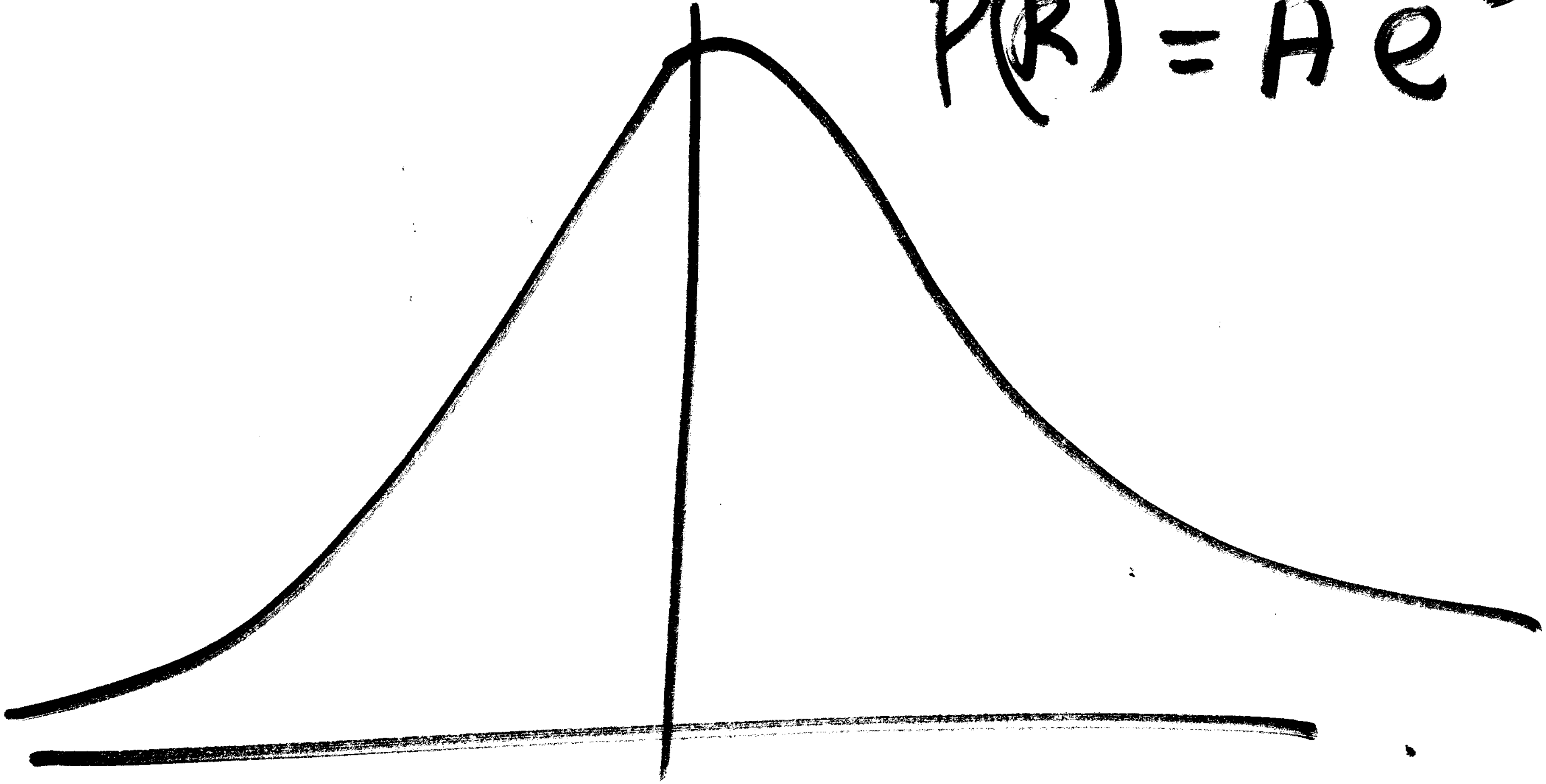
$$\boxed{\sigma \propto \sqrt{N}}$$

$$\sigma = \langle x^2 \rangle - \langle x \rangle^2 \propto \sqrt{t}$$



P(R)
0
R
L

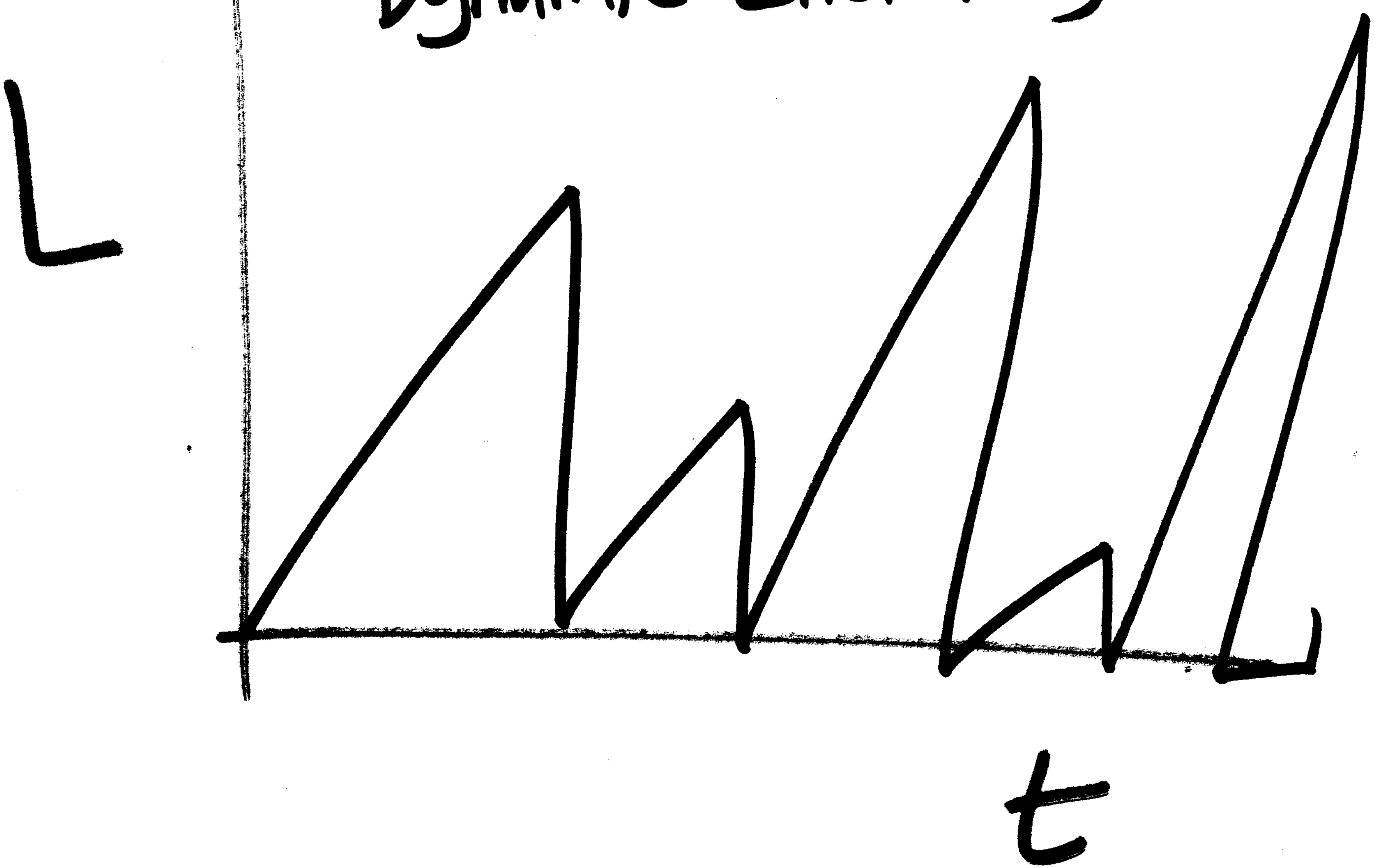
$$P(k) = A e^{-bk^2}$$

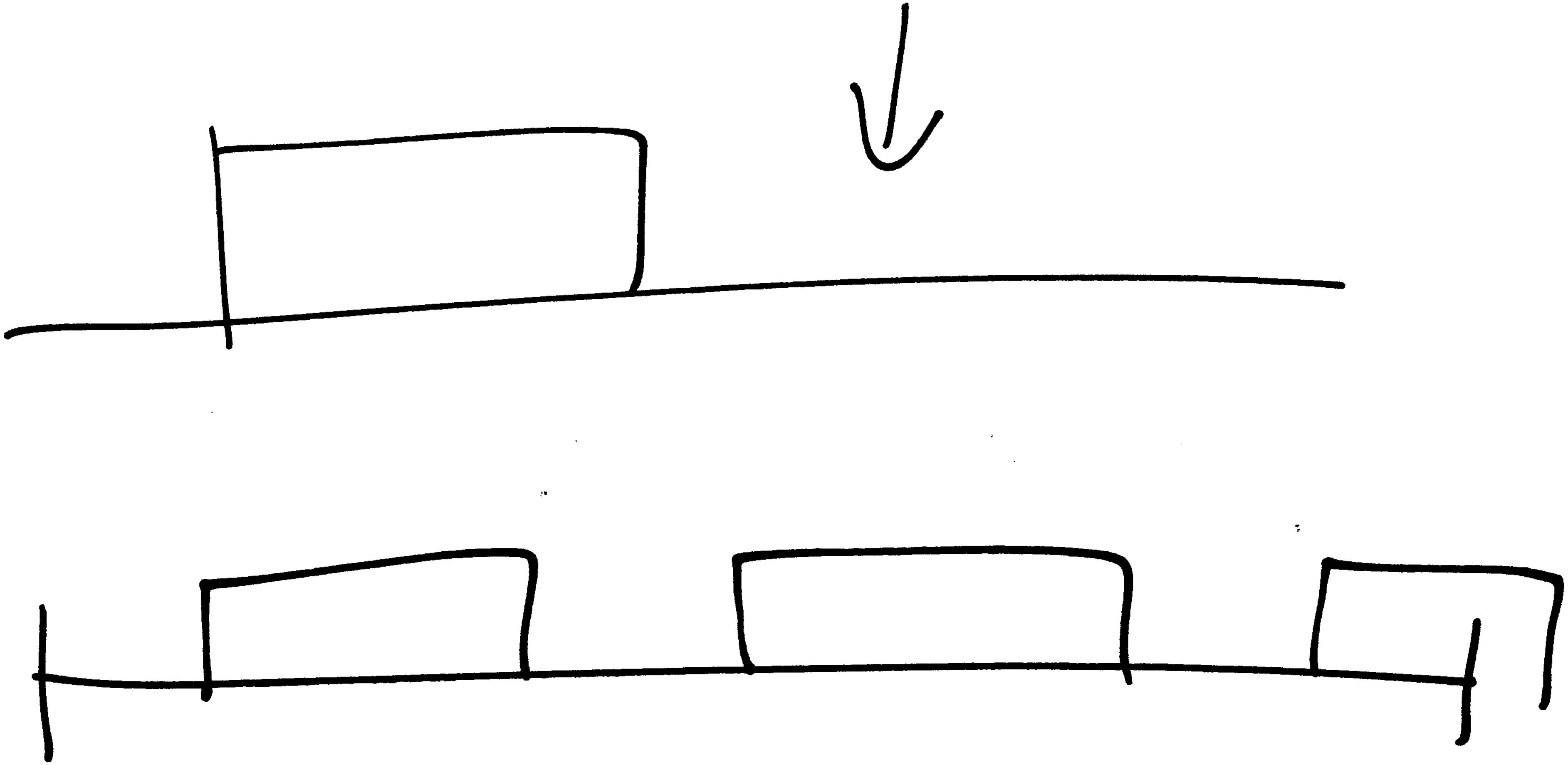


$$P(R) = A\, e^{-\frac{R^2}{2\sigma^2}}$$

$$\boxed{P(R) = A\, e^{-\frac{R^2}{2Nb^2}}}$$

Dynamic Instability





"dt"

$\cancel{P\,\Delta t}$ $\quad P(dt) = ?$

$$P(x) = A e^{-kx}$$

$$\int P(x)\,dx = 1$$

$$\int A e^{-kx}\,dx = 1$$

$$A\left[\frac{e^{-kx}}{-k}\right]_0^{\infty} = A\left[0 - \frac{-1}{k}\right]$$

$$A\int_0^{\infty} e^{-kx}\,dx = 1$$

$$A\int_{-0}^{\infty} e^{-kx}\,dx = \cancel{k}\,\frac{A}{K} = 1$$

$$\Rightarrow A = K$$

$$P(x) = K e^{-kx}$$

$$\langle x \rangle = ?$$

$$\langle x \rangle = k \int_0^\infty \underbrace{x \, \cancel{k} \, e^{-kx}} \, dx$$

$$= \int_0^\infty \overbrace{-\frac{\partial}{\partial k} e^{-kx}} \, dx$$

$$\langle x \rangle = -k \int_0^\infty \frac{\partial}{\partial k} e^{-kx}\, dx$$

$$= -k \frac{\partial}{\partial k} \int_0^\infty e^{-kx}\, dx$$

$$= -k \frac{\partial}{\partial k} \left(\frac{1}{k} \right)$$

$$\langle x \rangle = -\kappa \frac{\partial}{\partial \kappa} \kappa^{-1}$$

$$= -\kappa(-1)\kappa^{-2} = \frac{\kappa}{\kappa^{2}} = \frac{1}{\kappa}$$

$$\langle x \rangle = \frac{1}{\kappa}$$

$$\langle x^2 \rangle = \int_0^\infty x^2 \, P(x) \, dx$$

$$= \int_0^\infty x^2 \, k e^{-kx} \, dx$$

$$=$$

$$\langle x^2 \rangle = K \int_0^\infty x^2 e^{-kx} \, dx$$

$$K \int_0^\infty \frac{\partial^2}{\partial k^2} e^{-kx} \, dx$$

$$K \frac{\partial^2}{\partial k^2} \int_0^\infty e^{-kx} \, dx$$

$$\langle x^2 \rangle = K \frac{\partial^2}{\partial K^2}\left(\frac{1}{K}\right) = \frac{2}{K^2}$$

$$\boxed{\langle x \rangle = \frac{1}{k}}$$

$$\langle x^2 \rangle = \frac{2}{k^2}$$

$$\boxed{\sigma = \frac{1}{k}}$$

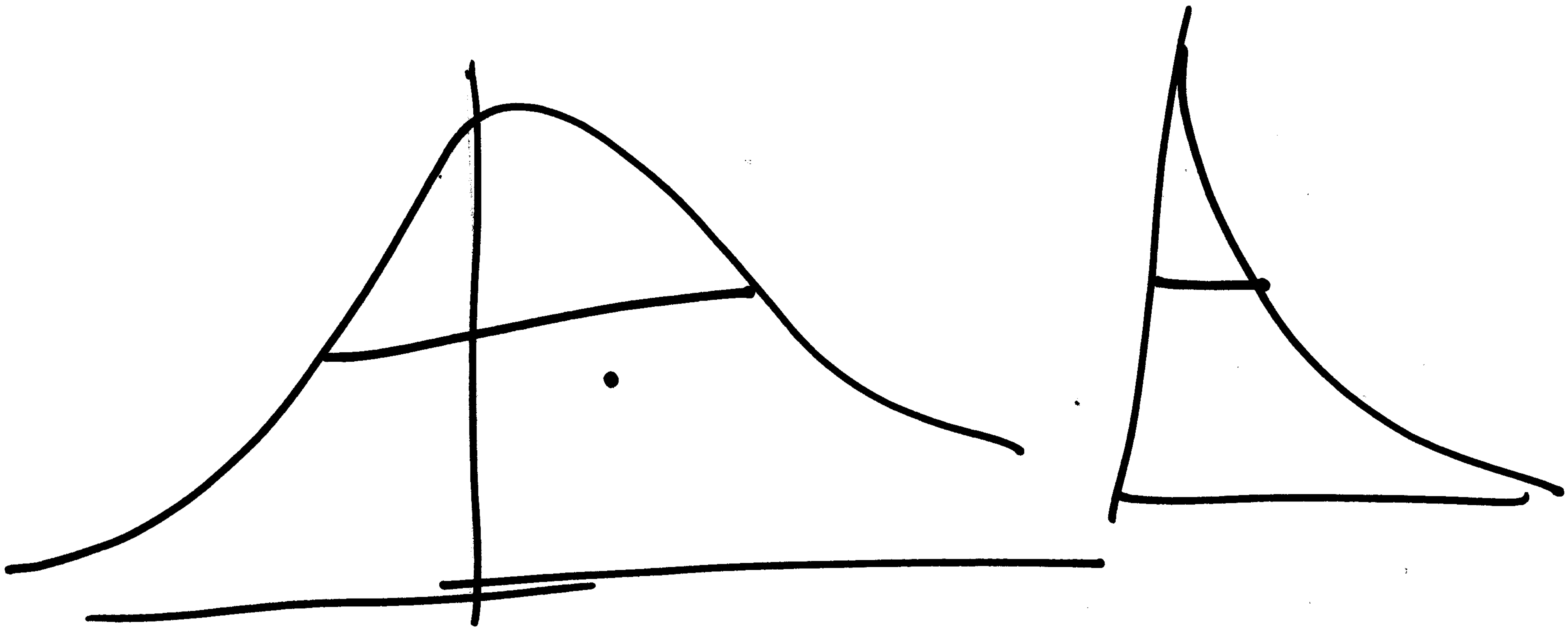
$$\langle dt \rangle = \frac{1}{K}$$

$$\sqrt{\langle dt^2 \rangle - \langle dt \rangle^2} = \frac{1}{K}$$

$$\langle l \rangle = (l_0)$$

$$\sqrt{\langle l^2 \rangle - \langle l \rangle^2} = (l_0)$$


L
time



- Normal Distribution

- Exponential distribution.