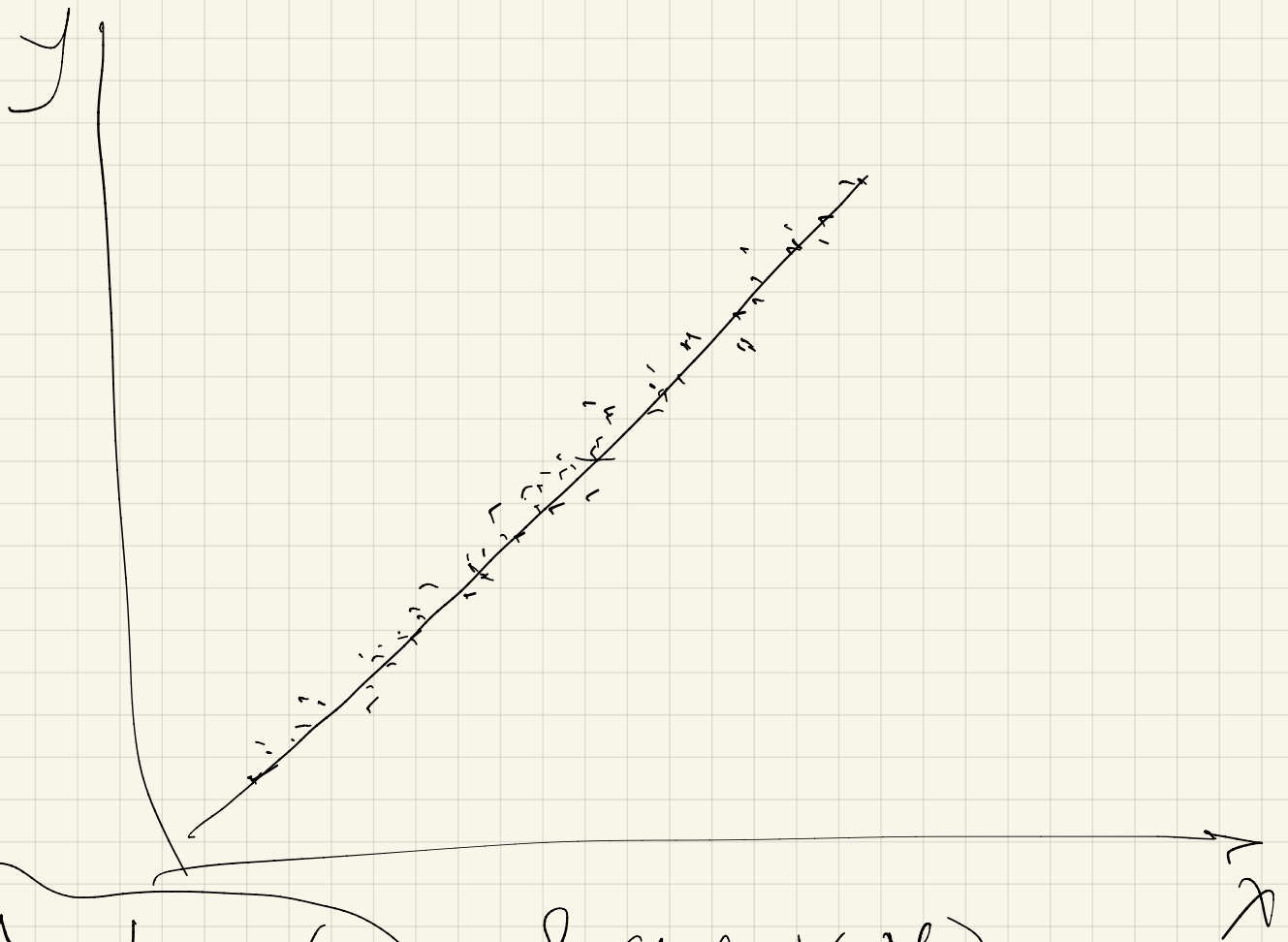


Linear regression



$$p(y/x, \theta) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(y-\mu)^2}{2\sigma^2}}$$

LINE



$$\hat{y} = kx + b$$

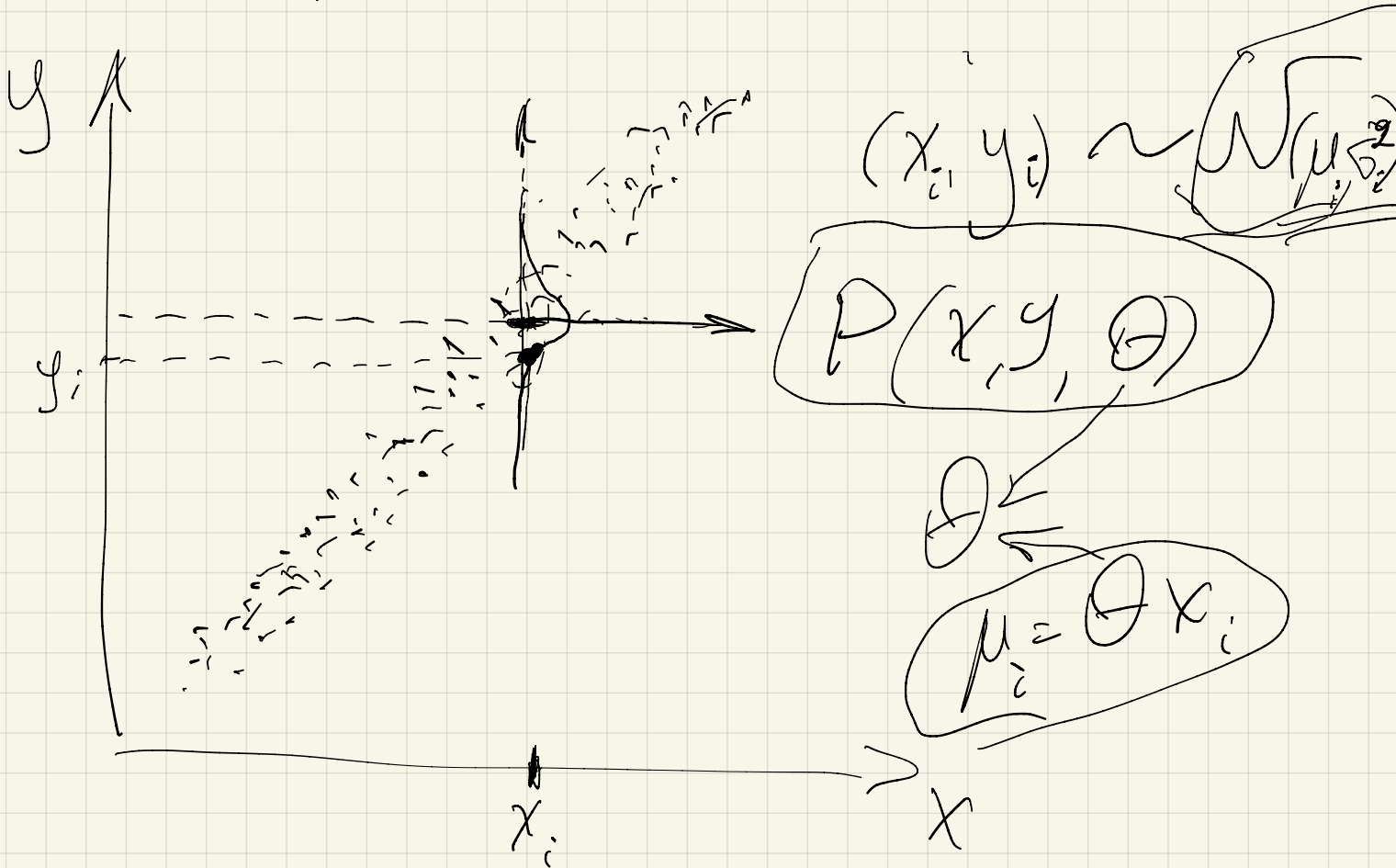
$$L(k, b, X, Y) = \frac{1}{N} \sum_{i=1}^N ((kx_i + b) - y_i)^2$$

$$k, b = \underset{K, B}{\operatorname{argmin}} L(k, b, X, Y)$$

LINE

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

$$P(A|B)P(B) = P(B|A)P(A)$$



$$P(y_i, x_i, \theta)$$

$$\textcircled{L} \textcircled{I} N E$$

$$P(\theta | \textcircled{X, Y}) P(X, Y) = P(X, Y | \theta) P(\theta)$$

$$P(\theta | X, Y) = \frac{P(X, Y | \theta) \cdot P(\theta)}{N P(X, Y)}$$

$$P(X, Y | \theta) = \prod_{i=1} P(x_i, y_i | \theta)$$

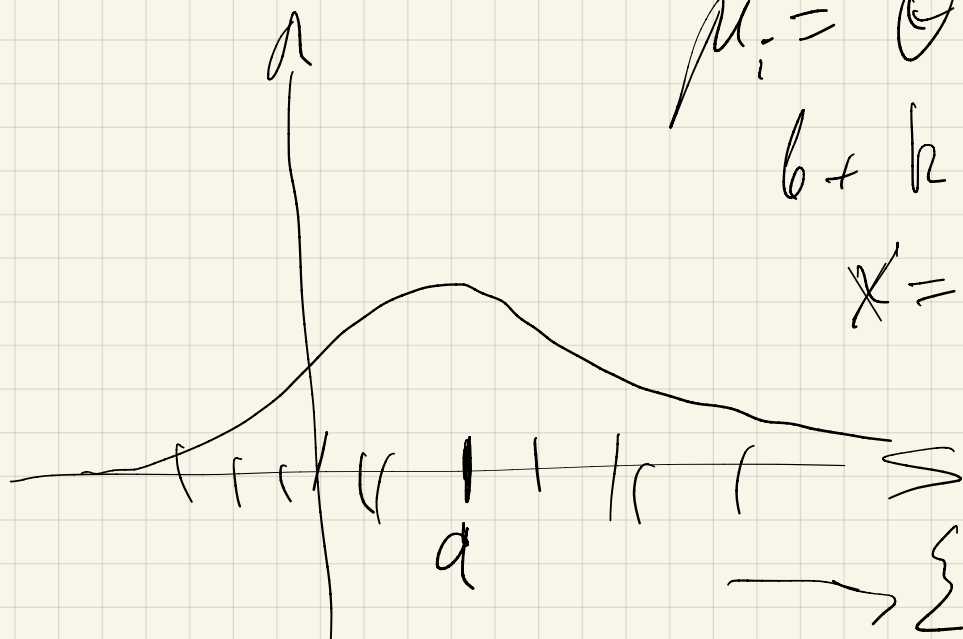
(independence)

$$P(x_i, y_i | \theta) = \frac{1}{\sqrt{2\pi}\sigma} \cdot e^{-\frac{(y_i - \mu_i)^2}{2\sigma^2}}$$

$$\mu_i = \theta x_i$$

$$b + kx$$

$$X = \begin{bmatrix} 1 & x \end{bmatrix}$$



$$X = \{1; x_1; x_2; x_3 \dots x_d\}$$

$$\theta X = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 + \dots \theta_d x_d$$

$$L, \quad \mu_i = \theta X_i$$

$$I \quad P(X, y | \theta) = \prod_{i=1}^N \frac{1}{\sqrt{2\pi\sigma_i^2}} e^{-\frac{(y_i - \mu_i)^2}{2\sigma_i^2}}$$

\mathcal{N}

E - equivariance $\sigma_i^2 = \sigma^2$

$P(X, y | \theta)$ - правдоподобие
likelihood

$$\ln P(X, y | \theta) = \ln \prod_{i=1}^N (\dots) =$$

$$= \sum_{i=1}^N \ln \left(\frac{1}{\sqrt{2\pi\sigma_i^2}} \cdot e^{-\frac{(\dots)^2}{2\sigma_i^2}} \right)$$

$$= \sum_{i=1}^N \ln \frac{1}{\sqrt{2\pi\sigma^2}} \cdot e^{-\frac{(y_i - \theta x_i)^2}{2\sigma^2}} =$$

$$= \sum_{i=1}^N \ln \frac{1}{\sqrt{2\pi\sigma^2}} + \sum_{i=1}^N \ln e^{-\frac{(y_i - \theta x_i)^2}{2\sigma^2}}$$

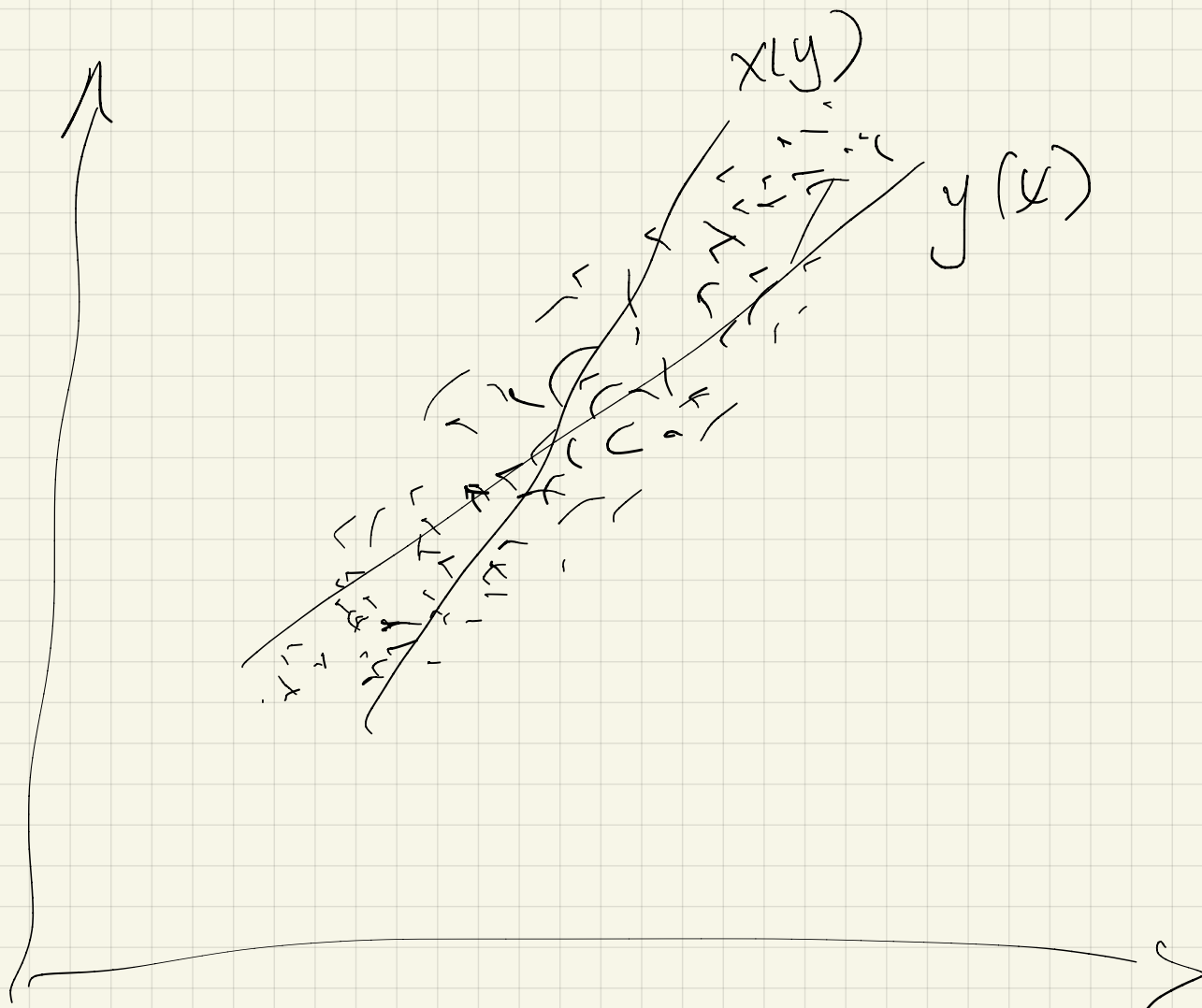
$$\hat{\theta} = \underset{(H)}{\operatorname{argmax}} P(X, Y | \theta) =$$

$$= \underset{(H)}{\operatorname{argmax}} \left(\sum_{i=1}^N \ln \frac{1}{\sqrt{2\pi\sigma^2}} + \sum_{i=1}^N \left(-\frac{(y_i - \theta x_i)^2}{2\sigma^2} \right) \right)$$

$$= \underset{(H)}{\operatorname{argmax}} \sum_{i=1}^N \left(-\frac{(y_i - \theta x_i)^2}{2\sigma^2} \right) (=)$$

$$(\Rightarrow) \underset{(H)}{\operatorname{argmin}} \left(\sum_{i=1}^N (y_i - \theta x_i)^2 \right)$$

$\mu_i = \theta x_i = \hat{y}$



$$L(X, Y, \theta) = \sum_{i=1}^N (y_i - \hat{y}_i)^2$$

$$\hat{y}_i = \mu_i = \theta x_i$$

$$x_i^{(0)} = 1$$

θ_0 -bias

$$(w) \rightarrow \left[\frac{\lambda}{2} e^{-\lambda |x - \mu|} \right] \quad \mu_i = \theta x_i$$