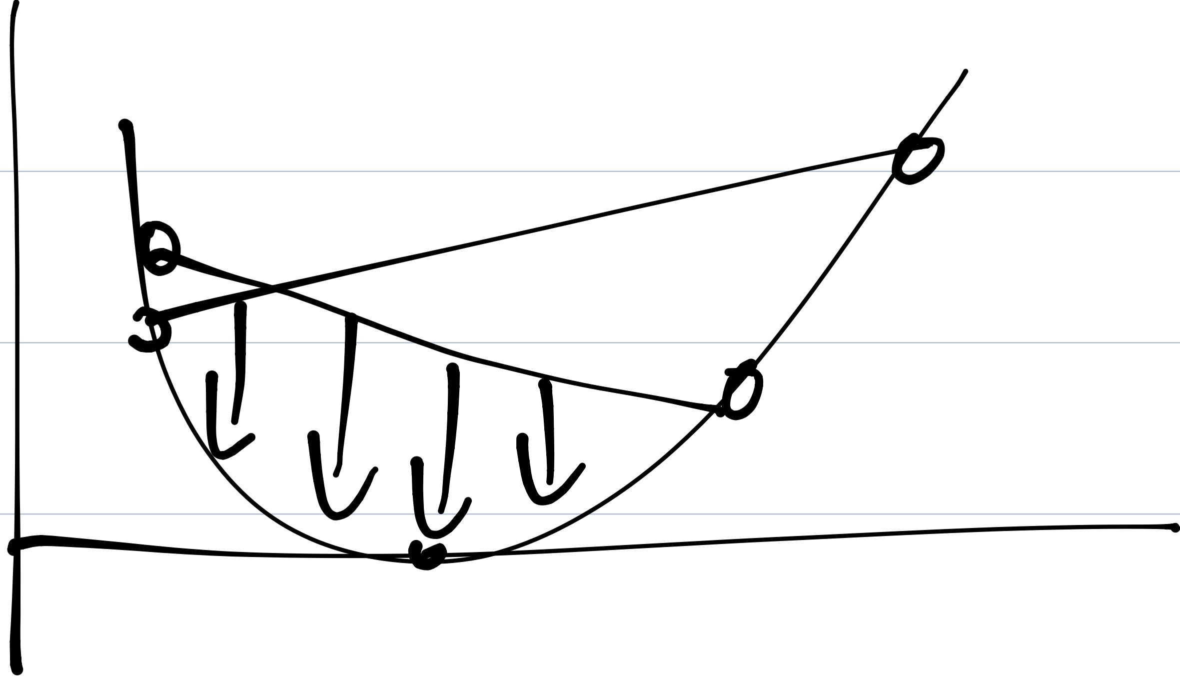
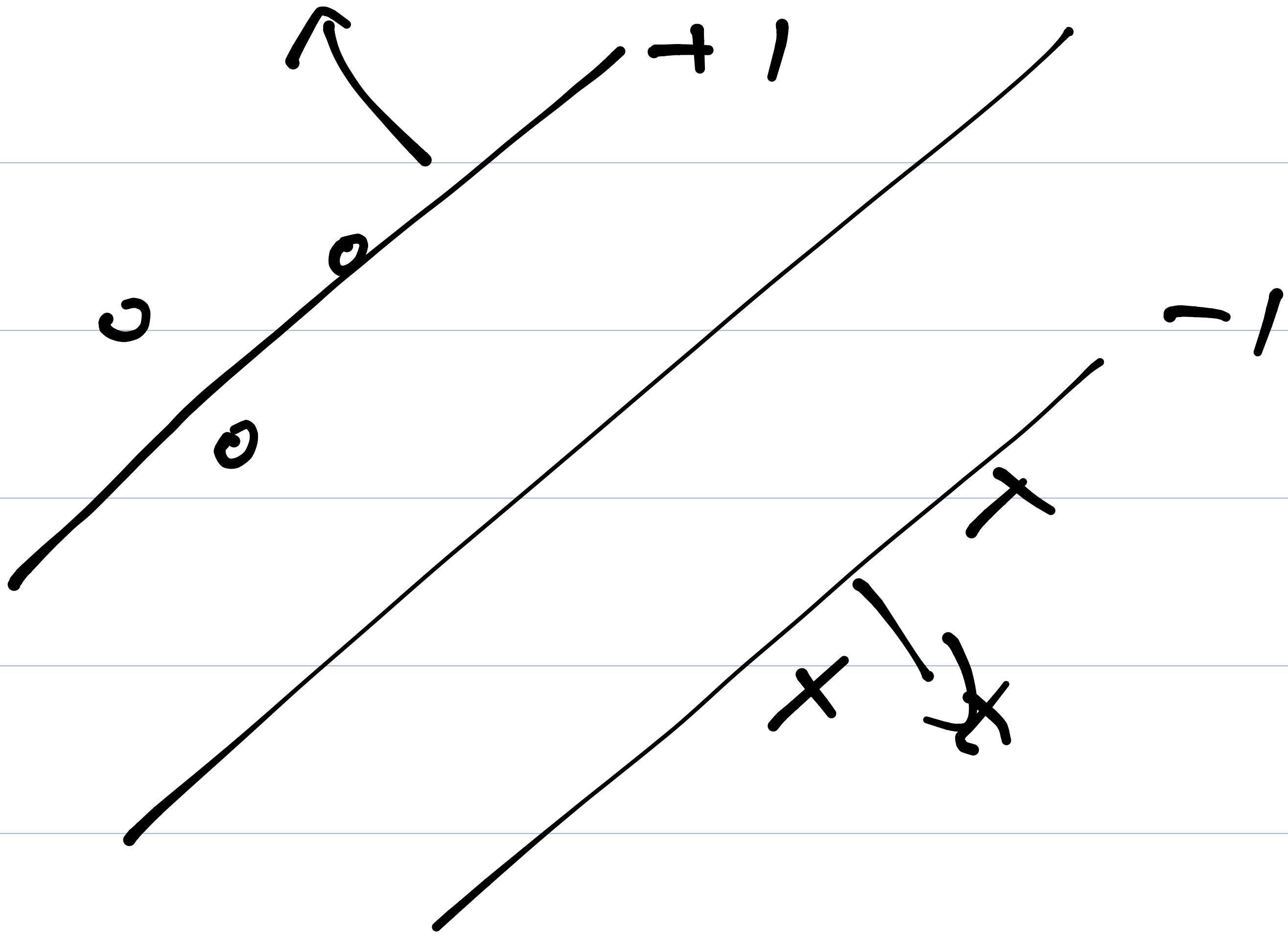




$P(y \mid x)$?

$P(X > x_0)$:

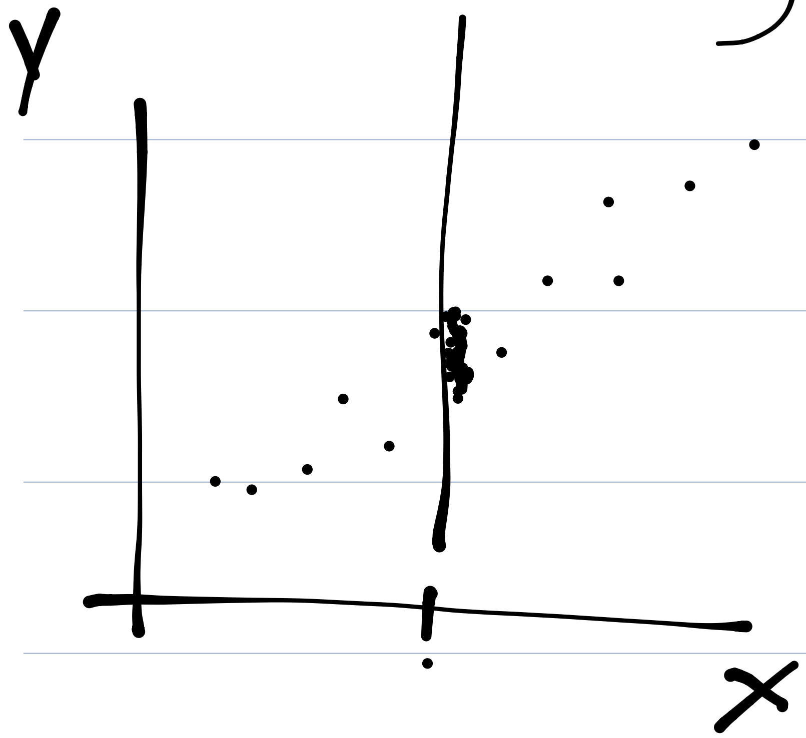
$x_0 \sim N(\underline{\mu}, \underline{\sigma^2})$

$x_1 \quad \vdots \quad \vdots$

$x_2 \quad \vdots \quad \vdots$

$$p(\vec{X}) = \prod_i p(x_i = x_i \mid \mu, \sigma^2)$$

Linear Regression



$$y_i = \underline{\langle \vec{x}_i, w \rangle} + \underline{\varepsilon}$$

$$p(y_i \mid \vec{x}_i, \vec{w}, \beta^{-1}) =$$

$$\mathcal{N}(y_i \mid \underline{\langle \vec{x}_i, \vec{w} \rangle}, \underline{\beta}^{-1})$$

$$p(\vec{y} \mid \{x_i\}, \vec{w}, \beta^{-1}) =$$

$$L = \prod_i N\left(y_i \mid \underline{\langle \vec{x}_i, \vec{w} \rangle}, \beta^{-1}\right)$$

ERROR = - log likelihood

$$E = -\log L$$

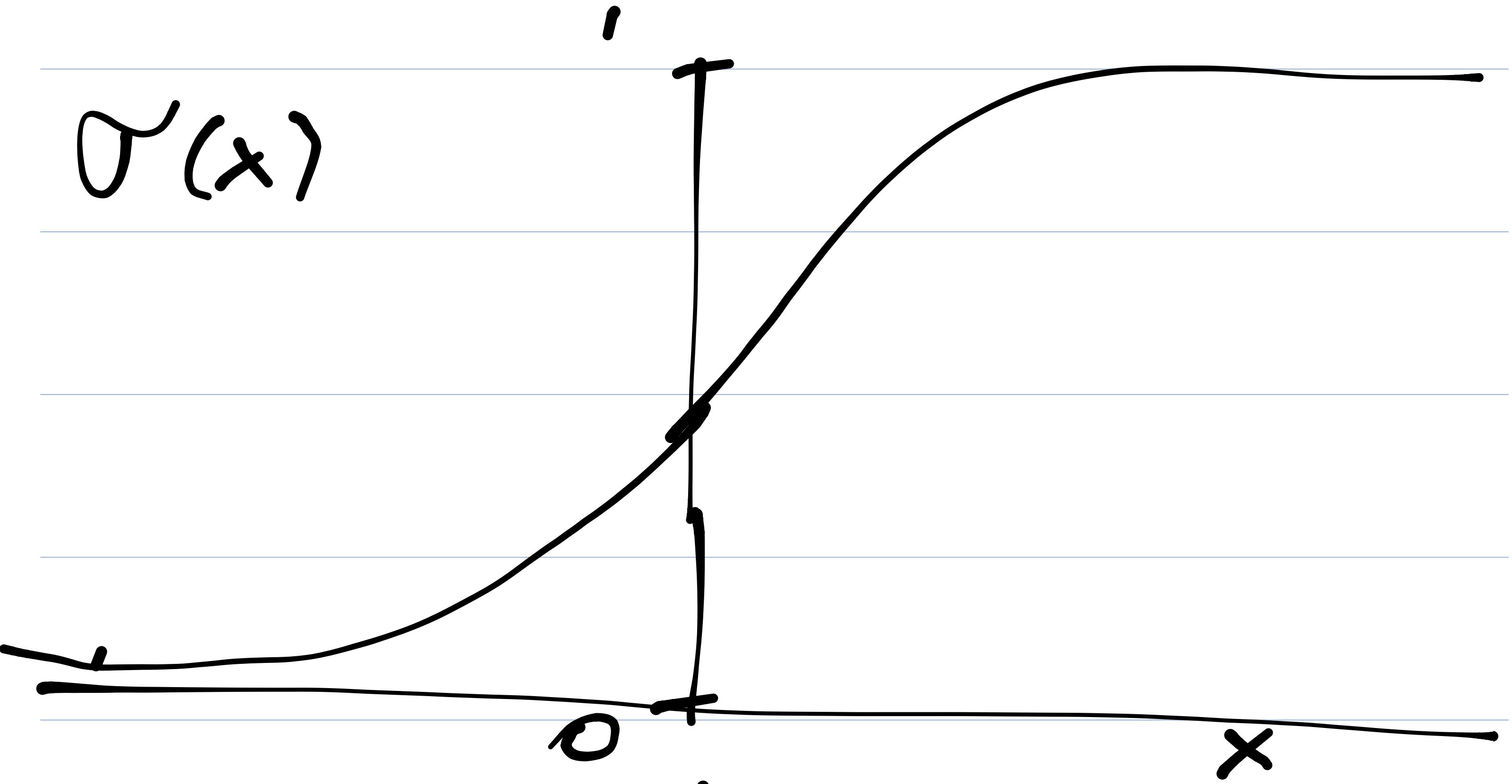
$$= -\sum_i \log N(\dots)$$

$$= -\sum_i \cancel{k_0} - \cancel{k_1} \underline{\left(y_i - \langle x_i, w \rangle\right)^2}$$

$$\nabla_w E = 0$$

$$0 = \sum_i \psi\left(y_i - \langle x_i, w \rangle\right)$$

Logistic Regression



$$\sigma(x) = \frac{1}{1+e^{-x}} = \frac{e^x}{e^x+1}$$

$$p_i = \sigma(\langle \vec{x_i}, \vec{w} \rangle)$$

$$L = \prod_i \boxed{p_i^{y_i} \cdot (1-p_i)^{(1-y_i)}}$$

$$\sigma(x) = \frac{e^x}{e^x + 1}$$

$$\frac{d\sigma}{dx} = \sigma(x) \cdot (1 - \sigma(x))$$

$$E = -\log L$$

$$-\log L = -\sum_i \left(y_i \log p_i + (1 - y_i) \log (1 - p_i) \right)$$

$$\nabla_w E = -\sum_i \left(y_i \cdot \frac{1}{p_i} \cdot p_i (1 - p_i) \right. \cdot w$$

TO BE CONTINUED