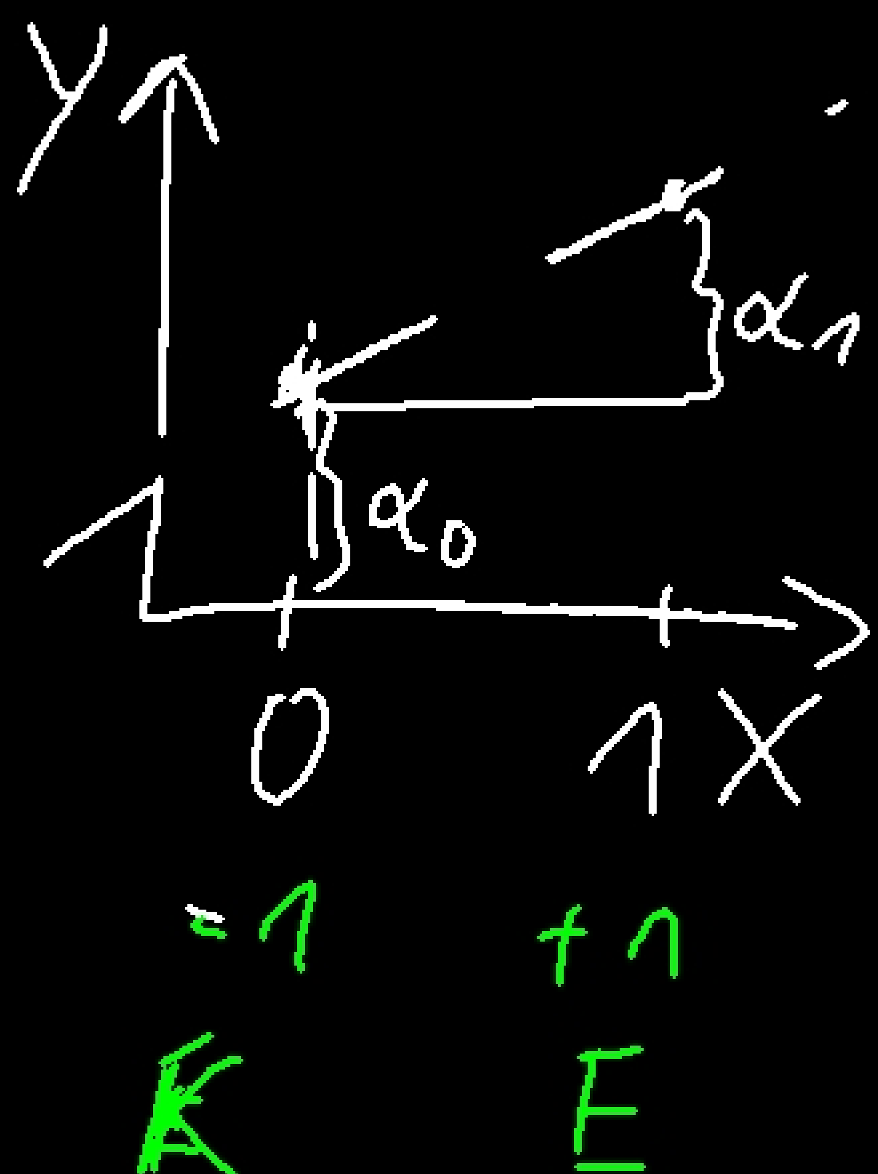
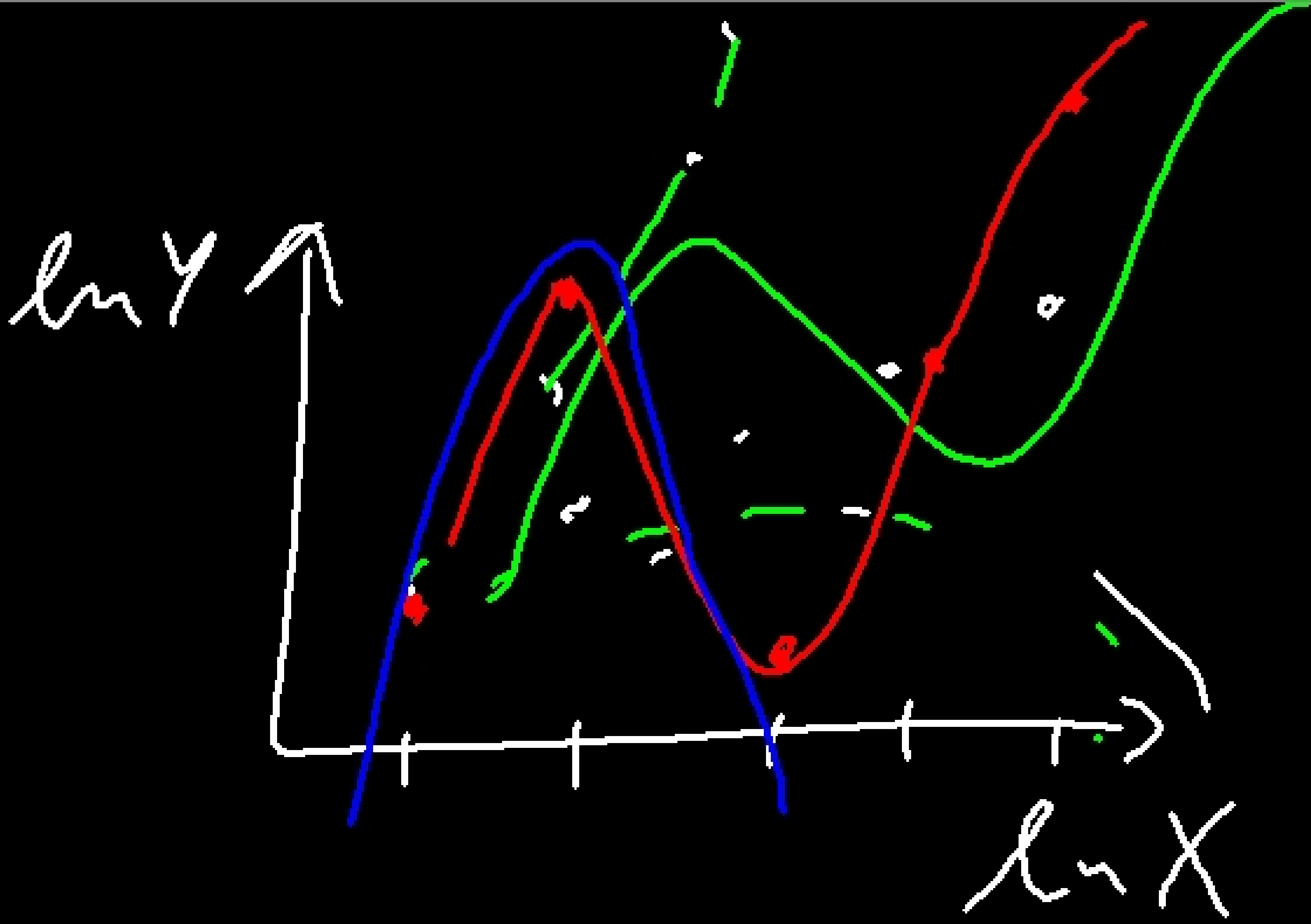
$$\mathrm{Var}\left[E(Y|X)\right] = \mathrm{Var}\left[\alpha_0 + \alpha_1 X\right]$$

$$= \alpha_1^2 \,\mathrm{Var}(X)$$

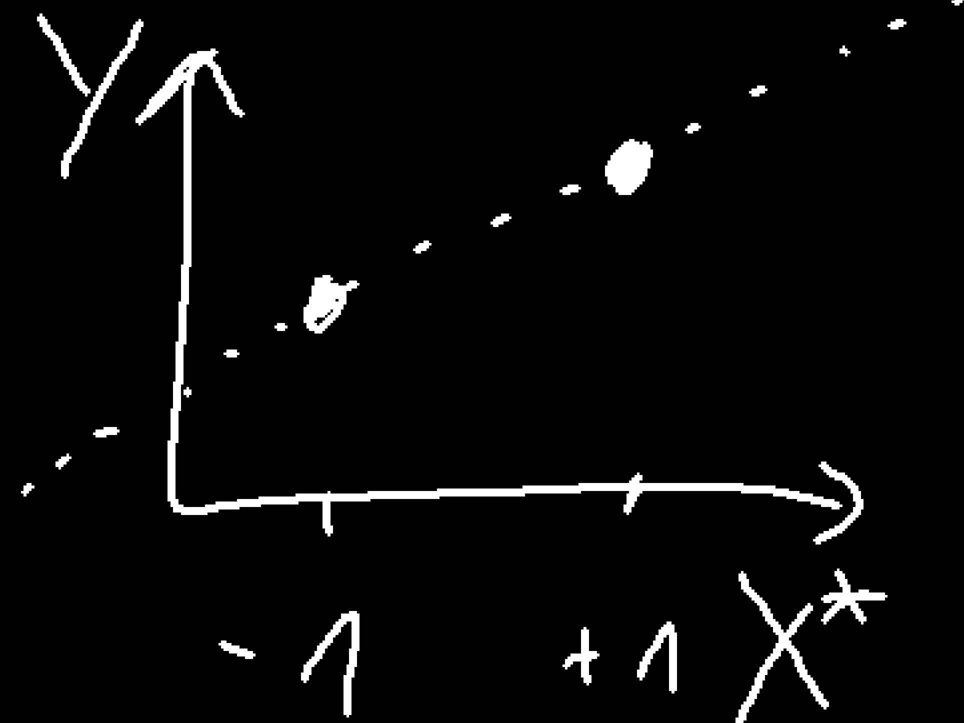
$$= \frac{\mathrm{Cov}(X,Y)^2 \cdot \cancel{\mathrm{Var}(X)}}{\mathrm{Var}(X) \cdot \cancel{\mathrm{Var}(X)}}$$


Y
1
α_1
α_0
0
1
X
-1
+1
K
E


ln Y
ln X

$$E(Y|X^*) = \alpha_0^* + \alpha_1^* X^*$$

$$X^* = \begin{cases} -1 \\ +1 \end{cases}$$



$$E(Y|X^*=-1) = \alpha_0 + \alpha_1 \cdot (-1)$$

$$\boxed{= \alpha_0 - \alpha_1}$$

$$E(Y|X^*=1) = \alpha_0 + \alpha_1 \cdot (+1)$$

$$\boxed{= \alpha_0 + \alpha_1}$$

$$\frac{E(Y|X^*=-1) + E(Y|X^*=1)}{2} = \cancel{2}\alpha_0 \quad | :2$$

$$\mathcal{E}(Y|X^*=-1)-\mathcal{E}(Y|X^*=1)$$

$$=-\alpha_1-\alpha_1=-2\alpha_1 \quad \Big| :-2$$

$$\frac{\mathcal{E}(Y|X^*=1)-\mathcal{E}(Y|X^*=-1)}{2}=\alpha_1$$

$$\mathcal{E}(Y|X) = \mathcal{E}(Y|X^*)$$

$$\mathcal{E}(Y|X=0) = \mathcal{E}(Y|X^*=-1)$$

$$\mathcal{E}(Y|X=1) = \mathcal{E}(Y|X^*=+1)$$