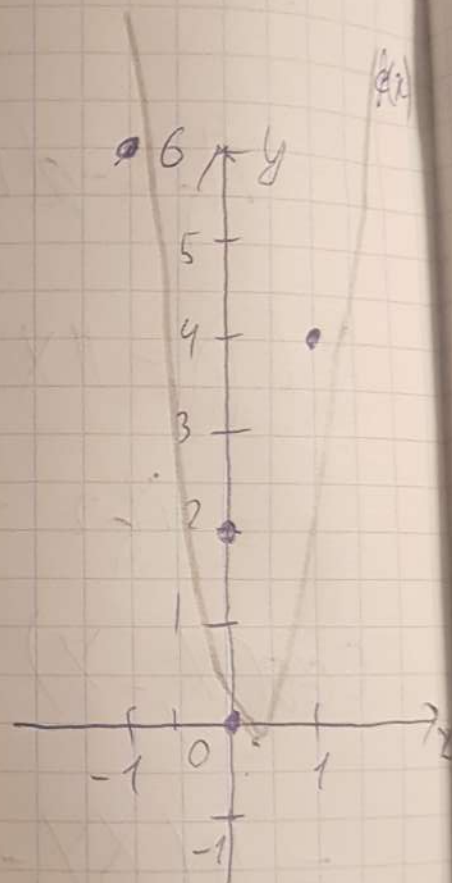
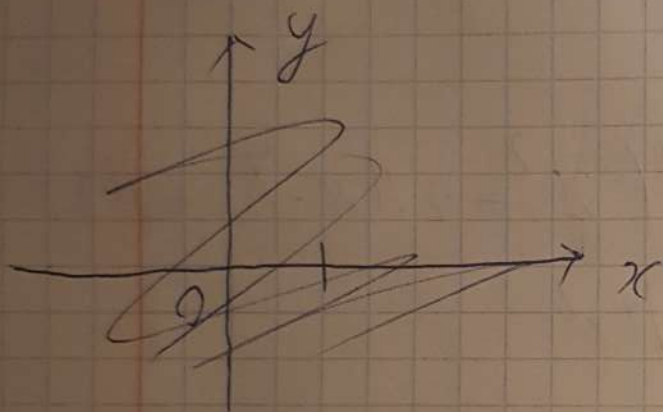


Митин Тимур

382003-3

~ 3(1,1)

x	1	1	0	0	-1
y	4	4	0	2	6



$$\phi(x) = \beta_0 + \beta_1 x + \beta_2 x^2$$

$$RSS(\beta) = \sum_{i=1}^5 \frac{1}{2} (y^{(i)} - \beta_0 - \beta_1 x^{(i)} - \beta_2 (x^{(i)})^2)^2$$

$$X = \begin{pmatrix} 1 & 1 \\ 1 & 1 \\ 1 & 0 \\ 1 & 0 \\ 1 & -1 \end{pmatrix} \quad y = \begin{pmatrix} 4 \\ 4 \\ 0 \\ 2 \\ 6 \end{pmatrix} \quad \beta = \begin{pmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \end{pmatrix}$$

$$RSS(\beta) = 16 - 5\beta_0 - \beta_1(1) - \beta_2$$

Rechnung um Parameter $\min RSS(\beta)$

$$\frac{\partial RSS(\beta)}{\partial \beta_i} = 0 \quad i = \overline{0, 2}$$

$$\frac{\partial RSS(\beta)}{\partial \beta_0} = 16 - 5\beta_0 - \beta_1 - \beta_2 \cdot 3 = 0$$

$$\begin{aligned} \frac{\partial RSS(\beta)}{\partial \beta_1} &= \sum_{i=1}^5 -x^{(i)} (y^{(i)} - \beta_0 - \beta_1 x^{(i)} - \beta_2 x^{(i)^2}) = \\ &= -2 + \beta_0 + 3\beta_1 + 2\beta_2 = 0 \end{aligned}$$

$$\begin{aligned} \frac{\partial RSS(\beta)}{\partial \beta_2} &= \sum_{i=1}^5 -x^{(i)^2} (y^{(i)} - \beta_0 - \beta_1 x^{(i)} - \beta_2 x^{(i)^2}) = \\ &= -14 - 3\beta_0 + \beta_1 + 3\beta_2 = 0 \end{aligned}$$

$$\begin{cases} -5\beta_0 - \beta_1 - 3\beta_2 = -16 \\ \beta_0 + 3\beta_1 + 2\beta_2 = 2 \\ -3\beta_0 + \beta_1 + 3\beta_2 = 14 \end{cases}$$

$$\begin{pmatrix} -5 & -1 & -3 \\ \boxed{1} & 3 & 2 \\ -3 & 1 & 3 \end{pmatrix} \begin{pmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \end{pmatrix} = \begin{pmatrix} -16 \\ 2 \\ 14 \end{pmatrix}$$

$$\left(\begin{array}{ccc|c} 0 & 14 & 4 & -6 \\ \boxed{1} & 3 & 2 & 2 \\ 0 & \boxed{10} & 9 & 20 \end{array} \right)$$

$$\left(\begin{array}{ccc|c} 0 & 0 & 4 - \frac{14 \cdot 9}{10} & -36 \\ \boxed{1} & 0 & 2 - \frac{9 \cdot 3}{10} & -4 \\ 0 & \boxed{10} & 9 & 20 \end{array} \right)$$

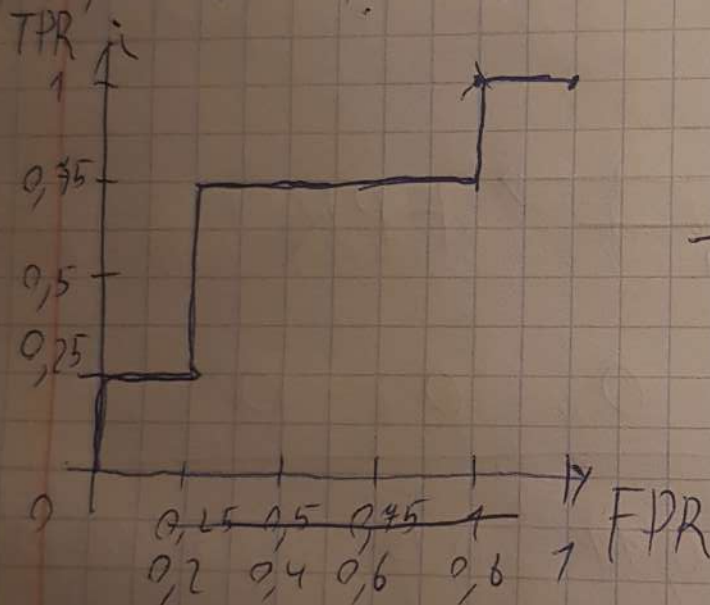
$$\beta = \begin{pmatrix} \frac{1}{4} \\ -\frac{94}{28} \\ \frac{25}{14} \end{pmatrix}$$

Problem: $g(x) = \frac{1}{4} - \frac{94}{28}x + \frac{25}{14}x^2$

$$TPR = \frac{TP}{FN + TP}$$

$$FPR = \frac{FP}{TN + FP}$$

$y^{(i)}$	0	1	0	0	0	1	1	0	1
$g(x^{(i)})$	0,09	0,1	0,11	0,15	0,23	0,5	0,66	0,75	0,82



— ROC кривая.

$$AUC = 0,1 \cdot 0,25 + 0,6 \cdot 0,5 + 0,1 \cdot 0,25 = 0,05 + 0,3 + 0,05 = 0,4.$$

$$\neg f(x) = I(g(x) \geq 0,5)$$

	N	P
$y=0$	4	1
$y=1$	1	3

$$FPR = \frac{1}{5}; FNR = \frac{FN}{FN+TP} = \frac{1}{4}$$

$$TNR = \frac{4}{5} \quad TPR = \frac{TP}{FN+TP} = \frac{3}{4}$$

$$PPV = \frac{TP}{FP+TP} = \frac{3}{4};$$

$$\text{accuracy} = \frac{4}{9}$$

$$\text{error} = \frac{2}{9}$$

$$F1 = 2 \cdot \left(\frac{3}{4} \cdot \frac{3}{4} \right) \left(\frac{3}{4} + \frac{3}{4} \right) = \frac{9}{8} \cdot \frac{4}{6} = \frac{3}{4}$$