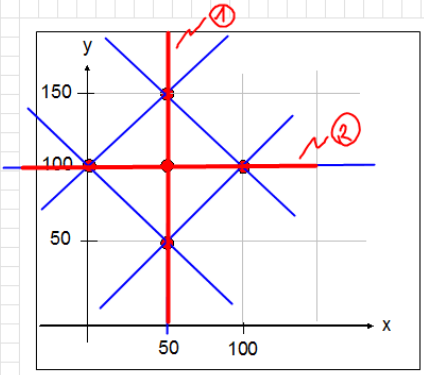
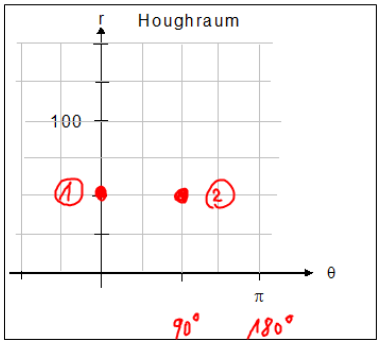
Aufgabe 1





a) 6 Maxima

c) $y = 3x + 2$

$3x - y = -2 \quad / :(-2)$

$-1.5x + 0.5y = 1 \quad \Rightarrow A = -1.5 \quad B = 0.5$

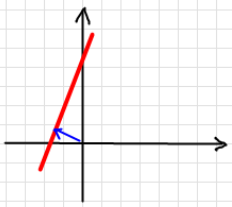
$x\cos\Theta + y\sin\Theta = r$

$\frac{\cos\Theta}{r}x + \frac{\sin\Theta}{r}y = 1$

$\Rightarrow \frac{B}{A} = \frac{\sin\Theta}{\cos\Theta} = \tan\Theta$

$\Theta = \arctan\frac{B}{A} = \arctan\left(-\frac{2}{2\cdot 3}\right) = -18.43°$ (Taschenrechner)

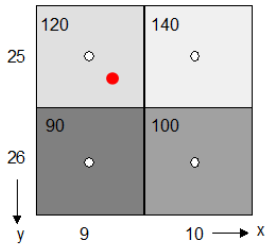
$+ 180°$



$\Theta = 161.6° \qquad r = \frac{\cos\Theta}{A} = 0.632$

$\Rightarrow 0.632 = x\cos 161.6° + y\sin 161.6°$

Aufgabe 2



$$f_{x_1} = 120 + (9.25 - 9) \cdot (140 - 120) = 125$$

$$f_{x_2} = 90 + (9.25 - 9) \cdot (100 - 90) = 92.5$$

$$f_y = 125 + (25.25 - 25) \cdot (92.5 - 125) = 116.875$$

mit rad. Basisfunktionen:

$$h_1(x,y) = e^{-\frac{(x-9)^2 + (y-25)^2}{2\sigma^2}} \qquad h_3(x,y) = e^{-\frac{(x-9)^2 + (y-26)^2}{2\sigma^2}}$$

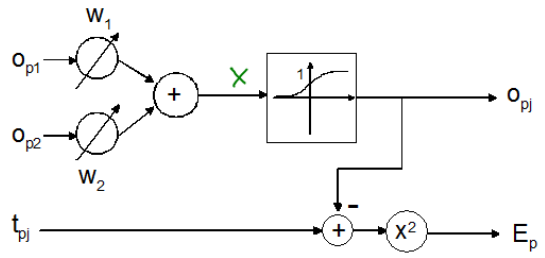
$$h_2(x,y) = e^{-\frac{(x-10)^2 + (y-25)^2}{2\sigma^2}} \qquad h_4(x,y) = e^{-\frac{(x-10)^2 + (y-26)^2}{2\sigma^2}}$$

$$f_{int}(x,y) = \frac{120\, h_1(x,y) + 140\, h_2(x,y) + 90\, h_3(x,y) + 100\, h_4(x,y)}{h_1(x,y) + h_2(x,y) + h_3(x,y) + h_4(x,y)}$$

$$f_{int}(9.25, 25.25) = \frac{120 \cdot 0.8825 + 140 \cdot 0.5353 + 90 \cdot 0.5353 + 100 \cdot 0.3247}{0.8825 + 0.5353 + 0.5353 + 0.3247}$$

$$= 114.8$$

Aufgabe 3



$$\begin{pmatrix} w_1 \\ w_2 \\ \dots \\ w_m \end{pmatrix}_{n+1} = \begin{pmatrix} w_1 \\ w_2 \\ \dots \\ w_m \end{pmatrix}_{n} + \eta \cdot 2(t_{pj} - o_{pj}) \cdot f'(net_{pj}) \cdot \begin{pmatrix} o_{p1} \\ o_{p2} \\ \dots \\ o_{pm} \end{pmatrix}$$

$t_{pj} = 1$

$$X = o_{p1} \cdot w_1 + o_{p2} \cdot w_2 = 0{,}2 \cdot 0{,}5 + 0.8 \cdot (-0.2) = \underline{-0.06}$$

$$o_{pj} = f_{log}(X) = \frac{1}{1 + e^{-(-0.06)}} = \underline{0.485}$$

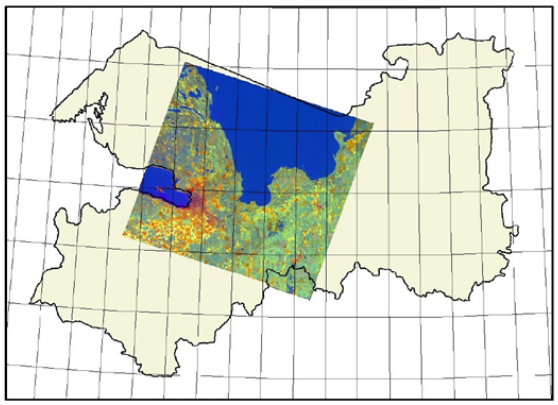
$$f'_{log}(X) = \frac{e^{-x}}{(1+e^{-x})^2} = \underline{0.2498}$$

$$\begin{pmatrix} w_1 \\ w_2 \end{pmatrix}_{n+1} = \begin{pmatrix} w_1 \\ w_2 \end{pmatrix}_{n} + \eta \cdot 2 \cdot (t_{pj} - o_{pj}) \cdot f'_{log}(x) \cdot \begin{pmatrix} o_{p1} \\ o_{p2} \end{pmatrix}$$

$$= \begin{pmatrix} 0.5 \\ -0.2 \end{pmatrix} + \frac{1}{2} \cdot 2 \, (1 - 0.485) \cdot 0.2498 \cdot \begin{pmatrix} 0.2 \\ 0.8 \end{pmatrix}$$

$$= \begin{pmatrix} 0.5 \\ -0.2 \end{pmatrix} + \begin{pmatrix} 0.0257 \\ 0.1029 \end{pmatrix} = \underline{\begin{pmatrix} 0.526 \\ -0.097 \end{pmatrix}}$$

Aufgabe 4



Zielbild 1800 · 1200

Quellbild 600 · 500

Q	Z
0,0	600, 200
500, 0	1200, 400
0, 400	400, 600

$$x_q = a_1 x_z + a_2 y_z + a_0$$

$$\left.\begin{aligned} 0 &= a_1 600 + a_2 200 + a_0 \\ 500 &= a_1 1200 + a_2 400 + a_0 \\ 0 &= a_1 400 + a_2 600 + a_0 \end{aligned}\right\} \quad \begin{pmatrix} 0 \\ 500 \\ 0 \end{pmatrix} = \begin{pmatrix} 600 & 200 & 1 \\ 1200 & 400 & 1 \\ 400 & 600 & 1 \end{pmatrix} \cdot \begin{pmatrix} a_1 \\ a_2 \\ a_0 \end{pmatrix}$$

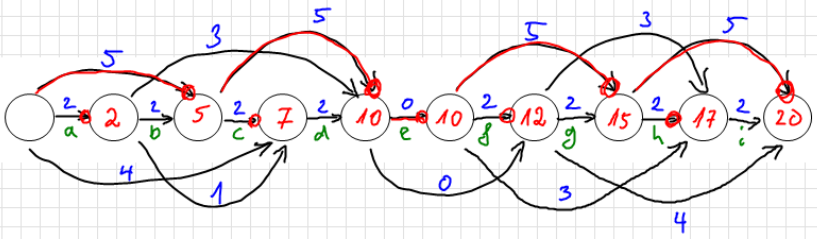
$$D_H = \begin{vmatrix} 600 & 200 & 1 \\ 1200 & 400 & 1 \\ 400 & 600 & 1 \end{vmatrix} = 240000 + 80000 + 72000 - 360000 - 240000 - 160000 = 280000$$

$$D_1 = \begin{vmatrix} 0 & 200 & 1 \\ 500 & 400 & 1 \\ 0 & 600 & 1 \end{vmatrix} = 300000 - 100000 = 200000$$

$$a_1 = \frac{D_1}{D_H} = \frac{20}{28} = \frac{5}{7} = 0.714$$ a_2, a_0 analog

Aufgabe 5

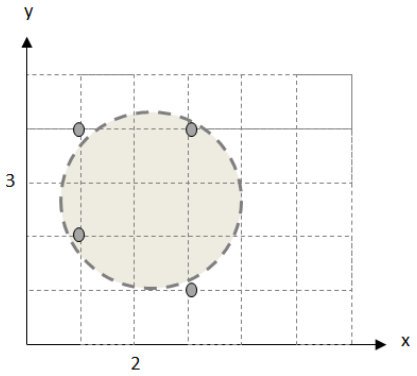
Segment/ S.-gruppe	a	ab	abc	b	bc	bcd	c	cd	d	e	ef	f	fg	fgh	g	gh	ghi	h	hi	i
Bewer-tung	2	5	4	2	1	3	2	5	2	0	0	2	5	3	2	3	4	2	5	2



Beste Sequenz: ab – cd – e – fg – hi

Aufgabe 6

$$x^2 + y^2 + ax + by + c = 0$$



Auf der Kreiskontur werden folgende Koordinaten gemessen:

Punkt	x	y
P1	1	4
P2	3	1
P3	3	4
P4	1	2

a) $ax + by + c = -x^2 - y^2$

$$\begin{pmatrix} 1 & 4 & 1 \\ 3 & 1 & 1 \\ 3 & 4 & 1 \\ 1 & 2 & 1 \end{pmatrix} \cdot \begin{pmatrix} a \\ b \\ c \end{pmatrix} = - \begin{pmatrix} 17 \\ 10 \\ 25 \\ 5 \end{pmatrix} \qquad \underline{A} \cdot \vec{\xi} = \vec{L}$$

b) Ausgleichung mit: $\underline{A}^T \underline{A} \cdot \vec{\xi} = \underline{A}^T \cdot \vec{L}$

$$\underline{A}^T \cdot \underline{A} = \begin{pmatrix} 1 & 3 & 3 & 1 \\ 4 & 1 & 4 & 2 \\ 1 & 1 & 1 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 & 4 & 1 \\ 3 & 1 & 1 \\ 3 & 4 & 1 \\ 1 & 2 & 1 \end{pmatrix} = \begin{pmatrix} 20 & 21 & 8 \\ 21 & 37 & 11 \\ 8 & 11 & 4 \end{pmatrix}$$

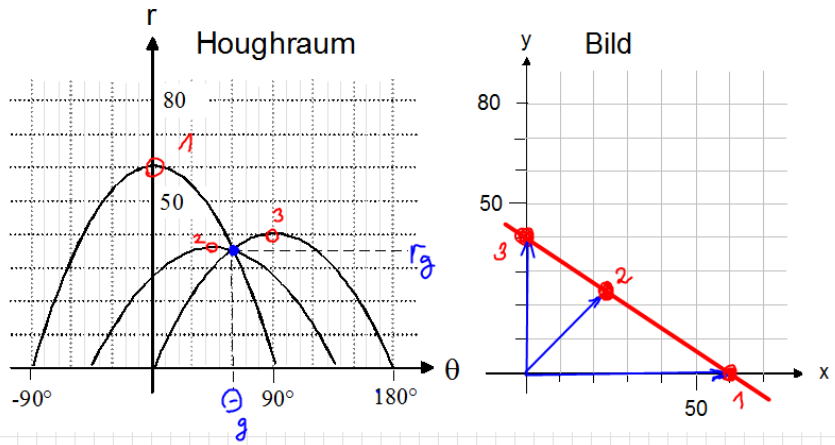
$$\underline{A}^T \cdot \vec{L} = \begin{pmatrix} 1 & 3 & 3 & 1 \\ 4 & 1 & 4 & 2 \\ 1 & 1 & 1 & 1 \end{pmatrix} \cdot \begin{pmatrix} -17 \\ -10 \\ -25 \\ -5 \end{pmatrix} = \begin{pmatrix} -127 \\ -188 \\ -57 \end{pmatrix}$$

c) $x_0 = -\frac{a}{2} = 2.2$

$y_0 = -\frac{b}{2} = 2.7$

$r = \sqrt{x_0^2 + y_0^2 - c} = 1.96$

Aufgabe 7:



1: $r_1 = 60$ $\Theta_1 = 0°$

2: $r_2 \approx 37$ $\Theta_2 = 45°$

3: $r_3 = 40$ $\Theta_3 = 90°$

Gemeinsame Grade:

$\Theta_g = 60°$, $r_g \approx 35$

$35 = x \cos 60° + y \sin 60°$

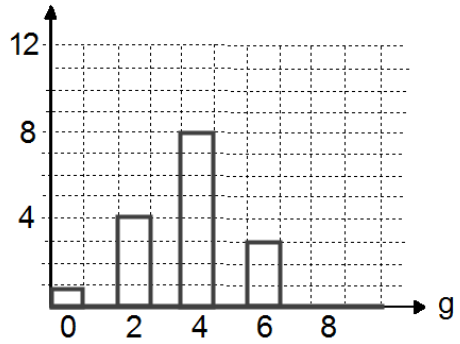
b) $35 = x \frac{1}{2} + y\, 0.866$

$y \cdot 0.866 = -0.5x + 35$

$y = -0.577x + 40.42$

Aufgabe 8

2	~~3~~ 2	4	4
~~3~~ 2	~~3~~ 2	~~5~~ 4	~~5~~ 4
4	~~5~~ 4	6	~~7~~ 6
4	~~5~~ 4	~~7~~ 6	~~1~~ 0



$254_D \hat{=} 11111110_B$

In	Out
0	0
1	0
2	2
3	2
4	4
5	4
6	6
7	6