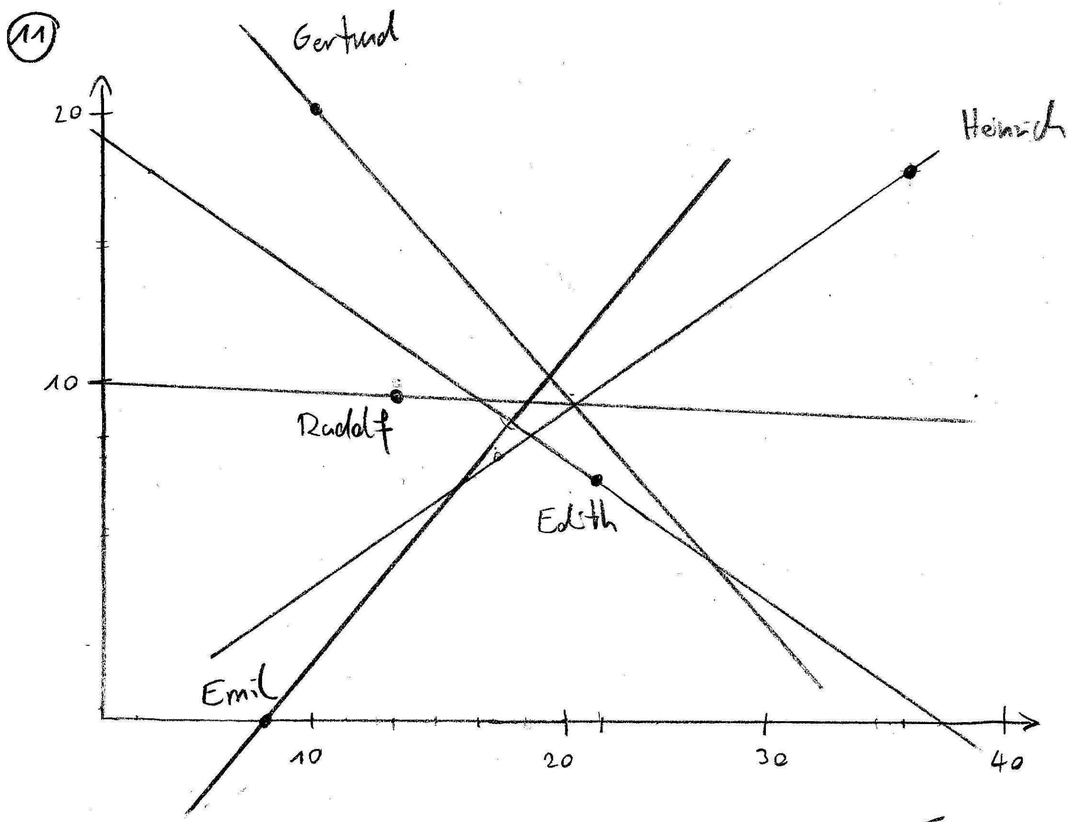
(11)



Bei exakter Messung läge die Position $(x^*, y^*)^T \in \mathbb{R}$ auf allen Geraden:

$$y - y^* = (\tan\alpha)(x - x^*)$$

$$\Leftrightarrow \underline{-(\tan\alpha)x + y = -(\tan\alpha)x^* + y^*}$$

Setze $b^n = -(\tan\alpha^n)x^n + y^n$, $A_{n1} = -\tan\alpha^n$, $A_{n2} = 1$

Ausgleichsprb: Finde $(x^*, y^*) \in \mathbb{R}^2$ Minimalstelle von

$$J(x,y) = \left\| A\binom{x}{y} - b \right\|_2^2$$

$\Leftrightarrow (x^*, y^*)$ löst Normalengl.

$$A^T A \binom{x}{y} = A^T b$$

$$A = \begin{pmatrix} -1 & 1 \\ 1/2 & 1 \\ -1/2 & 1 \\ 1 & 1 \\ 0 & 1 \end{pmatrix}, \quad b = \begin{pmatrix} -8 \\ 18 \\ 0 \\ 30 \\ 10 \end{pmatrix}$$

$$A^T A = \begin{pmatrix} 5/2 & 0 \\ 0 & 5 \end{pmatrix}, \quad A^T b = \begin{pmatrix} 47 \\ 50 \end{pmatrix}$$

$$\rightsquigarrow \underline{\begin{pmatrix} x^* \\ y^* \end{pmatrix}} = \begin{pmatrix} 94/5 \\ 10 \end{pmatrix} \approx \underline{\begin{pmatrix} 18{,}8 \\ 10 \end{pmatrix}}$$