$$\varphi : \underset{\underline{\underline{\beta}}}{V} \to \underset{\underline{\underline{\alpha}}}{U} \qquad \left((\varphi)_{\alpha,\beta} \mid (u)_\alpha \right)$$

$$(v_1, \dots, v_n) \qquad = \left((\varphi(v_1))_\alpha, \dots, (\varphi(v_n))_\alpha \right)$$

$$f = \underline{\underline{\varphi}} + \psi \qquad (u)_\alpha$$

$$(f \circ g)_{\alpha, \gamma} = (A \cdot B \mid Ab + a)$$

$$A\mathbb{y} = \mathbb{b}$$
$$A\mathbb{r} = \mathbb{b}$$
$$\overline{\qquad\qquad}$$
$$A(\mathbb{y} - \mathbb{r}) = 0$$
$$\mathbb{y} - \mathbb{r} \in \mathcal{R}(A)$$

$$A\mathbb{r} = \mathbb{b}$$
$$A\mathbb{x} = 0$$
$$\overline{\qquad\qquad}$$
$$A(\mathbb{r} + \mathbb{x}) = \mathbb{b}$$
$$\mathbb{r} + \mathbb{x} \in \mathcal{R}(A|\mathbb{b})$$

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$$\mathbf{r} + \mathcal{R}(A) \subseteq \mathcal{R}(A|\mathbf{b}) \ni \mathbf{y}$$

$$\mathbf{y} - \mathbf{r} \in \mathcal{R}(A)$$

$$\mathbf{y} = \mathbf{r} + (\mathbf{y} - \mathbf{r}) \in \mathbf{r} + \mathcal{R}(A).$$

$\mathbb{A}\mathbb{x}=\mathbb{b}$ má řešení $\iff$

$\exists\, \mathbb{x} \in \mathbb{K}^n \quad \sum_{j=1}^{n} x_j s_j(A) = \mathbb{b}$

$\iff \mathbb{b} \in [s_1(A), \dots, s_n(A)] \iff$

$\iff \underline{\dim [s_1(A), \dots, s_n(A)]} = \dim [s_1(A) \dots \mathbb{b}]$

$\iff h(A) = h(A|\mathbb{b})$

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$h(\alpha) < n$

$$\left(\begin{array}{c|c|c} A' & D & b' \\ \hline A & O & b \end{array}\right) \qquad \left(\begin{array}{c} D \\ \hline O \\ \underset{z}{\sim} \end{array}\right)\Big\} h(\alpha)$$

$$A'x = Dt + b'$$

$$Ax = Ot + b$$

$$Ax = b$$

$$F : V^n \to U$$

$\underline{\underline{n=2}}$ $\overline{|\ U, V, W}$

$$F : U \times V \to W$$

$x \in U$ $F(x, -) : V \to W$

$$F(x, c_1 y_1 + c_2 y_2) = c_1 F(x, y_1) + c_2 F(x, y_2)$$

$y \in V$, $F(-, y) : U \to W$ L2

$\mathbb{x} \in U$

$F(\mathbb{x}, -) : \mathbb{V} \to \mathbb{K}$ je $L\underline{2}$

$$\underline{\underline{\left((\mathbb{x})_\alpha^T A \right)}} \cdot (\mathbb{y})_\beta$$

$$a_{ij} = F(u_i, v_j)$$

$$x \in U, \quad (x)_\alpha = \begin{pmatrix} x_1 \\ \vdots \\ x_m \end{pmatrix}$$

$$y \in V \quad (y)_\beta = \begin{pmatrix} y_1 \\ \vdots \\ y_n \end{pmatrix}$$

$$F(x,y) = F\left(\sum_{i=1}^{m} x_i u_i, \sum_{j=1}^{n} y_j v_j\right) =$$

$$= \sum_{i=1}^{m} \sum_{j=1}^{n} x_i y_j F(u_i, v_j)$$

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