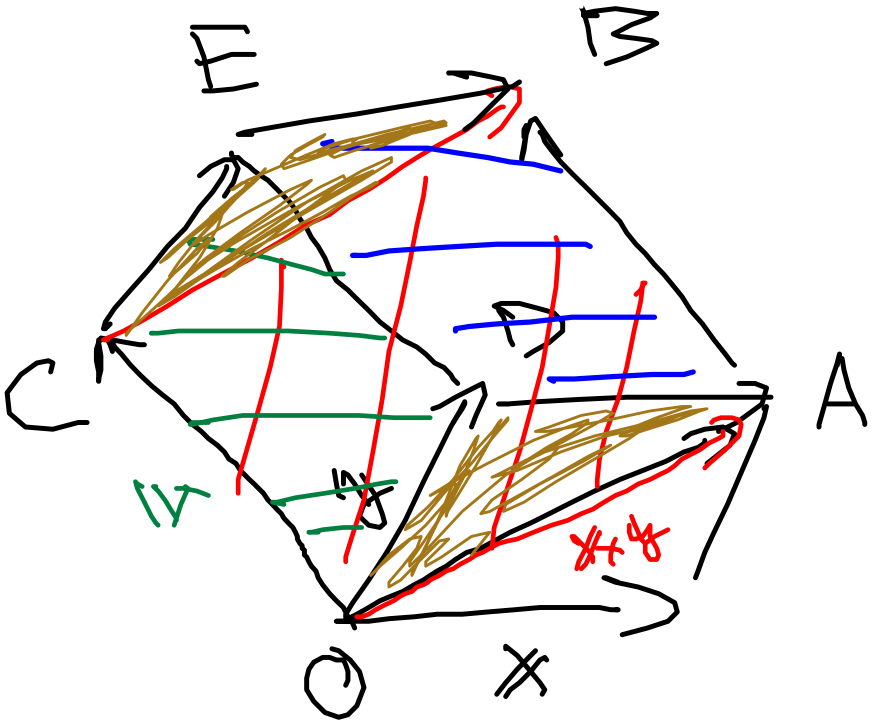
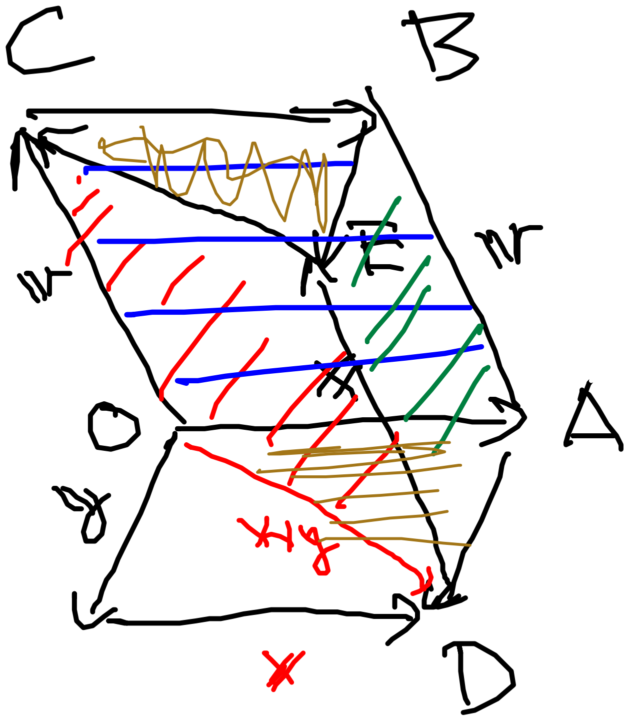


$P(x+y, r) = P(x, r) + P(y, r)$



$P(x+y, v) =$

$= P(x, v) -$

$- P(y, v)$

$P(x, y) = -P(y, x)$

$P(x, cy) = cP(x, y)$

$$P(x+y, v) = P(x, v) + P(y, v)$$

$$P(kx, v) = k\,P(x, v)$$

$$P(x, x)$$

ANTISYM $\Rightarrow$ ALT

$$F(u_1, \ldots, \underbrace{u_i, \ldots, u_j}_{\parallel}, \ldots, u_m) = 0$$

ALT + MULT $\Rightarrow$ ANTISYM.

$$F(u_1, \ldots, \underset{\uparrow_i}{u_i + u_j}, \ldots, \underset{\mathrm{r}}{u_i + u_j}, \ldots, u_m)$$

$$= 0 \ldots$$

$$= F(u_1, \ldots, \underset{i}{u_i}, \ldots, \underset{j}{u_i}, \ldots, u_n) +$$

$$+ F(u_1, \ldots, \underset{i}{u_i}, \ldots, \underset{j}{u_j}, \ldots, u_n) +$$

$$+ F(u_1, \ldots, \underset{i}{u_j}, \ldots, \underset{j}{u_i}, \ldots, u_n) +$$

$$+ F(u_1, \ldots, u_j, \ldots, u_j, \ldots, u_n)$$

$G(\,)$

σ napsat u jasný! $\ominus$

$$\sigma = \sigma_1 \circ \qquad \circ\, \sigma_2$$

$\sigma_1, \ldots, \sigma_\ell$ ha..

$$F(v_1, \ldots, v_i, \ \ldots \ v_j + c v_i, \ \ldots \ v_n) =$$

$$= F(v_1 \ \ldots \ \ldots \ , v_n) + c F(v_1, \ldots, v_i, \ldots v_i \ldots) \qquad \begin{matrix} i & j \\ \| & \\ 0 & \end{matrix}$$

$$v_k = \sum_{j<k} c_j v_j$$

$$F(v_1, \ldots, \sum_k c_j v_j, \ \ldots \ \ldots \ v_n) = \sum_{j<k} c_j F(v_1, \ldots v_j, \ldots v_j \ldots) \qquad \| \ 0$$

$A = (a_{ij})$ $\qquad$ $B = A^T = (b_{k\ell})$

$b_{k\ell} = a_{\ell k}$

$\det A^T = \det B = \sum_{\sigma \in S_n} (-1)^{|\sigma|} b_{\sigma(1)1} \cdot \ldots \cdot b_{\sigma(n)n}$

$= \sum_{\sigma \in S_n} (-1)^{|\sigma|} a_{1\sigma(1)} \cdot \ldots \cdot a_{n\sigma(n)}$

$\sigma \circ \rho = id$

$$= \sum_{\sigma \in S_n} (-1)^{|\sigma|} a_{\rho(1)1} \cdot a_{1j} \cdot a_{\rho(n)n}$$

$$\rho = \sigma^{-1} \qquad a_{1\sigma(1)} \cdot \ldots \cdot a_{n\sigma(n)}$$

$$\rho \circ \sigma = id \qquad \sigma(1) = j$$

$$\pm \quad \pm \quad + \qquad 1 = \rho\sigma(1) = \rho(j)$$

$$= \sum_{\rho \in S_n} (-1)^{|\rho|} a_{\rho(1)1} \cdot \ldots \cdot a_{\rho(n)n} = \det A$$

$$A = \begin{pmatrix} B & C \\ 0 & D \end{pmatrix}$$

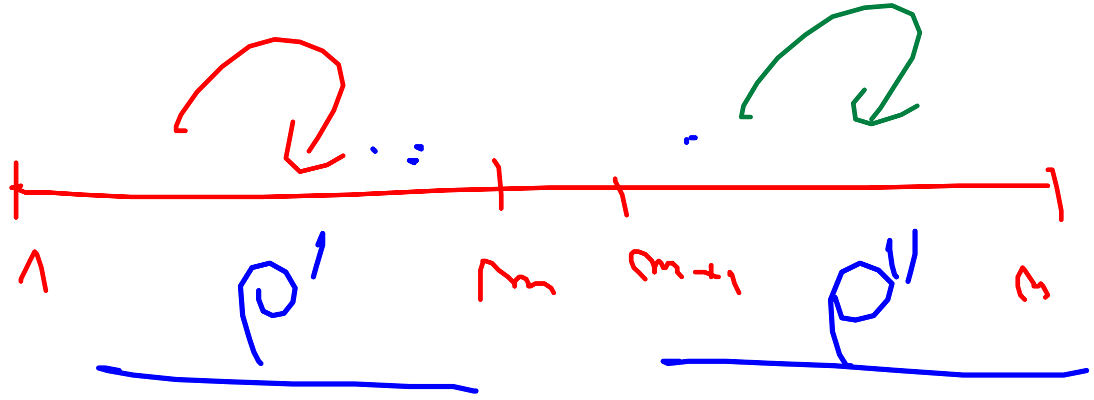
$$G = \{ \rho \in S_n : \; j \le m \Rightarrow \rho(j) \le m \}$$

$$\rho \in G \Rightarrow \; j > m \Rightarrow \rho(j) > m$$

$$\sigma \notin G \qquad \exists\, j_0 \le m \quad \rho(j_0) > m$$

$$a_{\rho(j_0)\, j_0} = \underline{\underline{0}}$$

$G \Rightarrow p \qquad |p| = |p'| + |p''|$



$p = (p', id) \circ (id, p'')$

$$\sum_{\sigma \in S_m} (-1)^{|\sigma|} a_{\sigma(1)1} \cdots a_{\sigma(m)m} =$$

$$= \sum_{\sigma \in G} (-1)^{|\sigma|} a_{\sigma(1)1} \cdots a_{\sigma(m)m} \quad , \; |D|$$

$$= |B|$$

$$= \sum_{\sigma' \in S_m} (-1)^{|\sigma'|} b_{\sigma'(1)1} \cdots b_{\sigma'(m)m} \cdot \sum_{\sigma'' \in S_{n-m}} (-1)^{|\sigma''|} d_{\sigma''(1)1} \cdots$$

$$\det(A \cdot B) = \det A \cdot \det B$$

$$F : K^{n \times n} \to K$$

$$F(A) = \det(A \cdot B)$$

$$F(I_n) = \det(I_n \cdot B) = \det B$$

$$F(A) = c \cdot \det A = \det B \cdot \det A$$

$$c = F(I_n)$$

$$F(A) = \det(\underline{\underline{AB}})$$

$$F(a_1', a_2, \ldots, a_n) + F(a_1'', a_2, \ldots, a_n) =$$

$$= F(a_1' + a_1'', a_2, \ldots, a_n)$$

$$AB =$$

$$F(k a_1', a_2, \ldots, a_n) = k F(a_1', a_2, \ldots, a_n)$$

$$\det(A\,A^{-1}) = \det(I_n) = 1$$

$$\| $$

$$\det A \quad \det A^{-1} \qquad\qquad \det A^{-1} = \frac{1}{\det A}$$

$$\neq \qquad\quad \neq$$

$$0 \qquad\quad 0$$

? $\det A \neq 0 \overset{?}{\Longrightarrow} A$ reg.

z nějá z lin. alg.: