

November-01-09
9:06 PM

* Today's last day to drop this class.

Advance blackboard in blue; today's class in black:

We have an isomorphism (?):

Abstract, general, coord-free

merely numbers,
choice-dependant
easy to work with

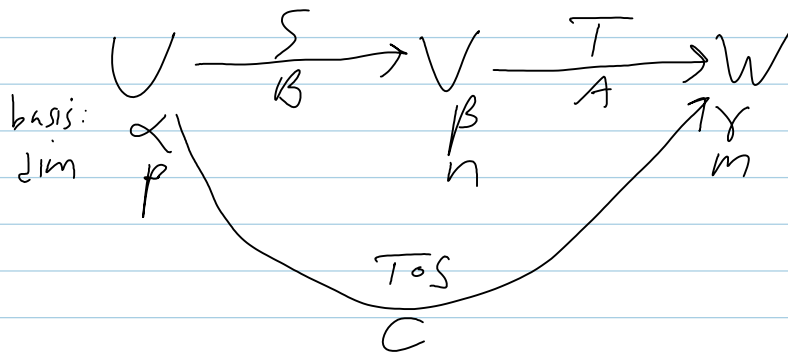
$$L(V, W) \longrightarrow M_{m \times n}(F)$$

$\dim = n \quad n$
 $\text{basis} = \beta \quad \gamma$
 $(v_1, \dots, v_n) \quad (w_1, \dots, w_m)$

$$T \longrightarrow [T]_{\beta}^{\gamma} = A$$

$$A = \left(\begin{array}{c|c|c} a_{11} & [TV_1]_{\gamma} & \\ \hline & [TV_2]_{\gamma} & \\ \hline & & \dots \\ \hline & [TV_n]_{\gamma} & \\ \hline a_{m1} & & \end{array} \right) \iff TV_j = \sum_{i=1}^m a_{ik} w_k$$

Complete the proof that this is a vector space iso.



If you know A and B, can you find C?

derive C, then:

Definition $A \in M_{m \times n}$, $B \in M_{n \times p}$ $A \cdot B \in M_{m \times p}$ by

$$(A \cdot B)_{ik} = \sum_{j=1}^n A_{ij} B_{jk}$$

Example $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \cdot \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{pmatrix} = \dots$

Also done:

Example:

$$T_{\alpha} \circ T_{\beta} = T_{\alpha \cup \beta}$$

for rotations.

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \cdot \begin{pmatrix} 0 & 1 \\ -1 & 1 \end{pmatrix} = \dots$$

is ps eqs
for rotations.

Thm $[T \circ S]_{\alpha}^{\gamma} = [T]_{\beta}^{\gamma} \cdot [S]_{\alpha}^{\beta}$

done in full

Question A matrix $A \in M_{m \times n}$ defines a linear trans^{started}

$$T_A: F^n \rightarrow F^m \text{ by } v \in F^n = M_{n \times 1} \mapsto T_A v = A \cdot v \in M_{m \times 1} = F^m.$$

What's the matrix corresponding to T_A ?

untouched.

The good and the bad about "matrix algebra":

Good	Bad
1. $A+B=B+A$, $(A+B)+C=A+(B+C)$ (basically, all works for addition)	1. Addition is defined only for matrices of same dims.
2. $A(B \cdot C) = (A \cdot B)C$ $\exists I$ s.t. $A \cdot I = A$, $I A = A$	2. mult. is defined only if "in" dimension matches & produces an output of yet other dims.
3. $\exists I$ s.t. $A \cdot A^{-1} = I$, then $A^{-1} A = I$	3. A^{-1} may not exist even if $A \neq 0$.
4. $(A+B)C = AC + BC$ $A(B+C) = AB + AC$	4. Generally, $A \cdot B \neq B \cdot A$, even when both make sense.

Next goals: 1. Compute rank T/A .

2. Compute A^{-1} (when possible)

3. Solve systems of linear eqn's.