240AlgebraI-091110, Hours 26-27: Computing ranks, solving equations

November-09-09
2:45 PM

Two lies: 1. Math is "everyday" useless.

2. Last class' riddle came up "out of math".

... show a "HandoutBrowser" sample.

On board: We have an isomorphism

$$\{M_{m\times n}(F)\}_{\substack{\text{all}\\ m,n}} \xrightarrow{A \mapsto (v \mapsto Av)} \{\mathcal{L}(F^n, F^m)\}_{\substack{\text{all}\\ n,m}}$$

in $F^n = M_{n\times 1}$ in $F^m = M_{m\times 1}$

$0, +, c\cdot \longrightarrow 0, +, c\cdot$

matrix multiplication $\longrightarrow$ Composition

The good and the bad about "matrix algebra":

on board

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. $A\cdot I=A$, $IA=A$	2. mult. is defined only if "mid" dimension matches, & produces an output of yet other dims.
3. If $A\cdot A^{-1}=I$, 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.

done line

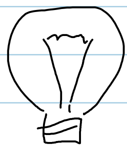
Next goals: 1. Compute rank T/A.

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

Next goals: 1. Compute rank of A.

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

3. Solve systems of linear eqn's.

 - PAQ "simpler" than A.

done.

Claim rank $\begin{pmatrix} \overbrace{1 \ \ddots \ 1}^{k} & 0 \\ 0 & 0 \end{pmatrix} = k$

mentioned.

Examples of "good" P/Q: 1. Interchanging rows/columns.

2. Multiplying r/c by a scalar.

3. Adding a multiple of one r/c to another.