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

$T_A : F^n \to F^m$ 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?

... Thus from now hence we will often automatically think of a matrix A also as a l.t. $F^n \to F^m$.

untouched.

Another way of seeing $[T]_\beta^\gamma$:

$$\begin{tikzcd} \beta=(v_1,\dots v_n)\ V \arrow[r, "T"] \arrow[d] & W\ \gamma=(w_1,\dots w_m) \arrow[d] \\ F^n \arrow[r, "{[T]_\beta^\gamma}"] & F^m \end{tikzcd}$$

$v_i \mapsto e_i$ $\quad v \mapsto [v]_\beta$ $\qquad w \mapsto [w]_\gamma$ $\quad w_j \mapsto e_j$

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. *done line*
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.

$A(B+C) = AB + AC$ | 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.
