Vector spaces & subspaces

∴ Beginning of real algebra (one can say)

⊛ Seeing a bigger picture of Vector spaces

⊛ Not just vectors, but space of vectors and subspaces of those vectors!

Permutations P: and they execute row exchanges

But what happens to:

$A = LU$

⇒ This assumes we don't have P's

∴ i.e. row exchanges.

So how do we account for row exchanges? (2)

∴ This is the description of Elimination with row exchanges:

$$PA = LU$$

How do we transpose a matrix?

$$\begin{bmatrix} 1 & 3 \\ 2 & 3 \\ 4 & 1 \end{bmatrix}^T$$

∴ transpose will be 2×3 (rows × cols)

$$\begin{bmatrix} 1 & 2 & 4 \\ 3 & 3 & 1 \end{bmatrix}$$

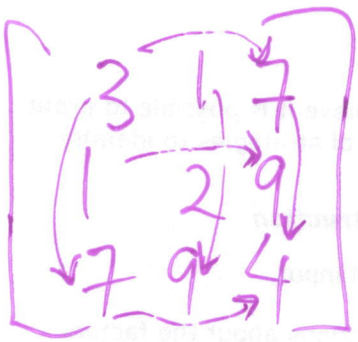
∴ formula for transpose

Transpose: $(A^T)_{ij} = A_{ji}$ (i – row, j – col; swapped row/col.)

∴ this transpose does not change matrix symmetrical.

$A^T = A$ ∴ Transpose gives Back Same Matrix

Eg



Now lets ~~start~~ with Vector Spaces!

Operations

& Rules of Vectors!

Vector Spaces

But what mean by space?

Lots of vectors → add, multiply (rules)

∴ also we can conduct operations between vectors, and still stay in the "space"

→ [closed]

MUST stay in space [or subspace]

Lets create subspace of

$$A = \begin{bmatrix} 1 & 3 \\ 2 & 3 \\ 4 & 1 \end{bmatrix}$$

Column in $\mathbb{R}^3$

↓

Need to put C(A) in subspace

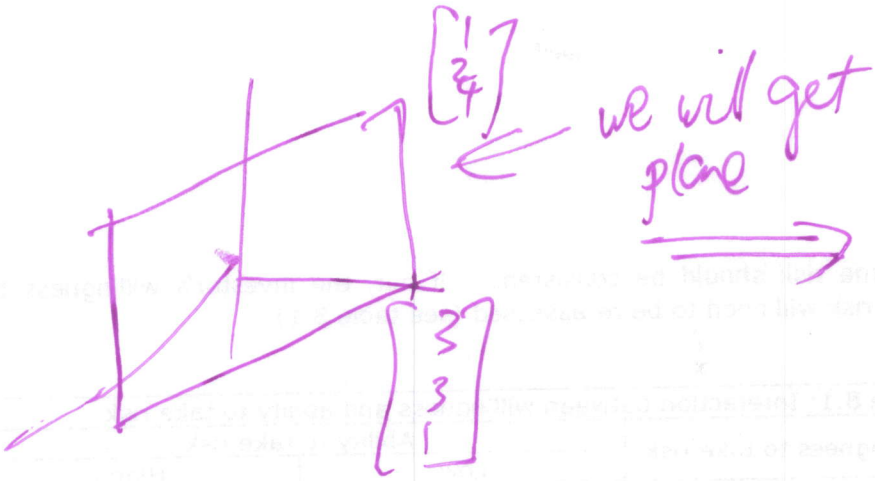
↓ and what else must be in the for subspace.

∴ must be able to add

∴ need to take all the linear combinations

↑ meaning - multiplying numbers
- and adding vectors

⇒ Called Column Space C(A)



∴ How to create subspace from matrix:

— take its columns
— take their combinations
— now we get column space