$A = LU$

$\Downarrow$

$PA = LU \Rightarrow$ for any invertable matrix A

※：进行消元时需进行行互换

permutation matrix

所有的P存在 P^{-1}，且 $P^{-1} = P^T$

$P^T \cdot P = I$

Transpose Matrix:

$A_{ij} = (A^T)_{ji}$

Symmetric Matrix

$A_{ij} = A_{ji}$，$A = A^T$

$A \cdot A^T$ 是一个对称矩阵. why?

eg: $A: m \times n$ A^T $n \times m$

$B = A \cdot A^T : m \times m$

$\because B_{ij} = \underbrace{\text{row } i \text{ of } A}_{} \times \underbrace{\text{col } j \text{ of } A^T}_{}$

same

same

$\because B_{ji} = \underbrace{\text{row } j \text{ of } A}_{} \times \underbrace{\text{col } i \text{ of } A^T}_{}$

$\therefore B_{ij} = B_{ji}$

so B is a symmetric Matrix.

$\underline{(A \cdot A^T)^T = A \cdot A^T}$, so $A \cdot A^T$ is symmetric

Chapter 3 Vector space

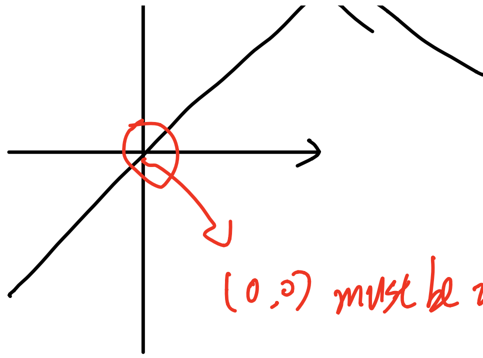
R^2 : 2-dim vectors x-y plane eg: $\begin{bmatrix} 1 \\ 2 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

R^3 : 3-dim vectors.

$\downarrow$

两两相加、数乘、线性组合

仍在 R^2 内



a subspace of R^2

满足 add and multiply

(0,0) must be in the space

subspace of R^2:

① R^2 itself

② any line through (0,0)

③ zero vector alone