$\boxed{\text{Independence:}}$

Defimitation : vectors $x_1, x_2 \cdots x_n$ are independence if no combination gives zero vector(except all 0 combination)

If there is zero in vectors, it must be dependence.

$$\begin{cases} R(A) = n & \text{independence.} \\ R(A) < n & \text{dependence} \end{cases}$$

$\boxed{\text{Basis}}$ 基.

Basis for a vector is a sequenced vectors. $v_1, \cdots v_2 \cdots v_l$ has two properties:

① . they are independence

② they can span the space.

Example:

space is R^3.

one basis is : $\begin{bmatrix}1\\0\\0\end{bmatrix}\begin{bmatrix}0\\1\\0\end{bmatrix}\begin{bmatrix}0\\0\\1\end{bmatrix}$

another: $\underbrace{\begin{bmatrix}1\\1\\2\end{bmatrix}\begin{bmatrix}2\\2\\5\end{bmatrix}}_{\text{a plane}}\underbrace{\begin{bmatrix}3\\3\\8\end{bmatrix}}_{\text{not in the plane}}$

$\boxed{R^n: \text{需要 } n \text{ 个 basis. 这组 } n \text{ 个 basis 构成的 } n\times n}$

vector must be inverse。

↓

矩阵要可逆则没有非0解使得 $Ax=0$

Every basis for the space has the same number vectors.

the number is called the dimension of the space.

$Rank(A)$ = pivot numbers = dimension of column space

$n - R(A)$ = free varibles number = dimension of Null space