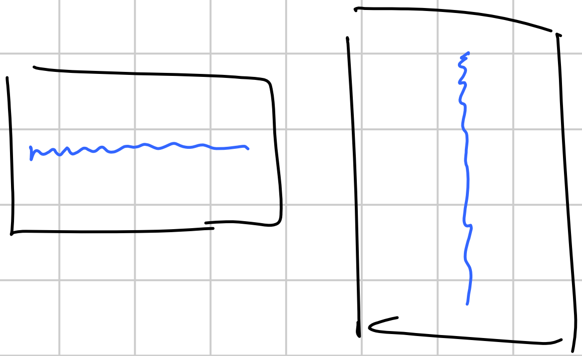
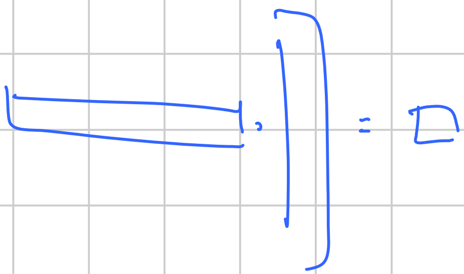
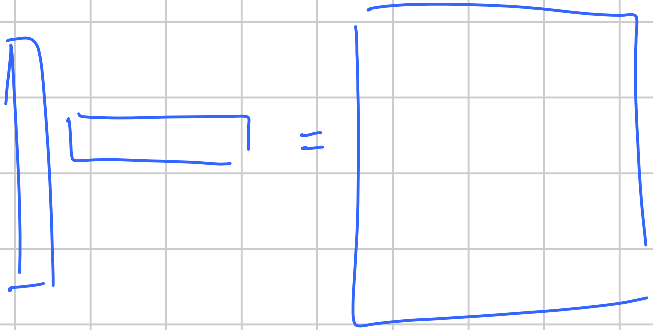
Note Title 5/12/2017

$m \times n \quad n \times p = m \times p$







$1 \times n \qquad n \times 1$

$$\begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} \begin{bmatrix} w_1 & w_2 & w_3 \end{bmatrix} = \begin{bmatrix} v_1 w_1 & v_1 w_2 & v_1 w_3 \\ v_2 w_1 & \cdots & \\ & \ddots & \end{bmatrix}$$

$Ax = b$

$A \in \mathbb{R}^{n \times n}$ $\quad$ $b \in \mathbb{R}^n$ $\quad$ $\begin{cases} x + y = 5 \\ x - 5y = 18 \end{cases}$

$M_{n,n}(\mathbb{R})$

Trovare x tale che $Ax = b$

$x = A^{-1} b$ (se A invertibile)

Mnemonica per le barre:

$\frac{2}{5}$ $\quad$ $2/5$

$A^{-1}b$ "è un po' come" $\frac{b}{A}$ (! non esiste)

$A \backslash b$

$\downarrow$

A "sta sotto" la barra

$$\underbrace{1.0e}_{\text{"scorciatoia" per } \times 10^{\square}}-15 \qquad 1.0 \times 10^{-15}$$

$$10^{-15} \cdot \begin{bmatrix} 0.441 \\ 0 \end{bmatrix} = \begin{bmatrix} 0,441 \cdot 10^{-15} \\ 0 \cdot 10^{-15} \end{bmatrix}$$

$$10^{4} \cdot \begin{bmatrix} 4,938 \\ -3.0862 \end{bmatrix} = \begin{bmatrix} 4.938 \cdot 10^{4} \\ -3.0862 \cdot 10^{4} \end{bmatrix}$$

12345, 6789012345678 ... — 4

4

12345, 6789012344678... 4

0,00 ... 0 1

Se $Av = \lambda v$ per un certo $v \in \mathbb{C}^n$, $v \neq 0$, $\lambda \in \mathbb{C}$,

allora λ si dice autovalore della matrice A, eigenvalue

v si dice autovettore eigenvector

$$\begin{bmatrix} 1 & 5 \\ 2 & 4 \end{bmatrix}\begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 6 \\ 6 \end{bmatrix} = 6\begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$v = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} \qquad \|v\| = \sqrt{v_1^2 + v_2^2 + v_3^2}$$

$\left(\sqrt{|v_1|^2 + |v_2|^2 + |v_3|^2} \right.$ se sono complessi$\left. \right)$

$$\left\| \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix} \right\| = \sqrt{0^2 + 1^2 + 2^2} = \sqrt{5}$$

$$\begin{bmatrix} 0 & 1 & 2 \\ 3 & 4 & 5 \\ 6 & 7 & 8 \end{bmatrix}$$ ha rango 2

$\Rightarrow$ posso generare tutte le sue colonne come comb. lineari di solo 2 vettori

$$\begin{bmatrix} 2 \\ 5 \\ 8 \end{bmatrix} = 2 \cdot \begin{bmatrix} 1 \\ 4 \\ 7 \end{bmatrix} - 1 \cdot \begin{bmatrix} 0 \\ 3 \\ 6 \end{bmatrix}$$

Uni in posizione

$$\left.\begin{aligned} C(1,2) &= 1 \\ C(2,3) &= 1 \\ C(3,4) &= 1 \end{aligned}\right]$$

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for i = 1:3
    C(i, i+1) = 1
end
```

Es: generare

$$\begin{bmatrix} 2 & -1 & 0 & 0 & 0 \\ -1 & 2 & -1 & 0 & 0 \\ 0 & -1 & 2 & -1 & 0 \\ 0 & 0 & -1 & 2 & -1 \\ 0 & 0 & 0 & -1 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} x+1, & 3 \\ 1-x, & y \end{bmatrix} \begin{bmatrix} x \\ x \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$$

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ES: Scrivere una function $A = \text{antidiagonale}(n)$ che crea la matrice $n \times n$

$$\begin{bmatrix} 0 & & & 1 \\ & & \iddots & \\ & 1 & & \\ 1 & & & 0 \end{bmatrix}$$

ES: Scrivere la matrice

$$\begin{bmatrix} 2 & -1 & & 0 \\ -1 & 2 & -1 & \\ & -1 & 2 & -1 \\ & & \ddots & \ddots & -1 \\ 0 & & & -1 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 3 & \cdots & n \\ 2 & 3 & 4 & \cdots & n+1 \\ 3 & 4 & 5 & \cdots & n+2 \\ \vdots & & & & \\ n & n+1 & \cdots & & 2n-1 \end{bmatrix}$$