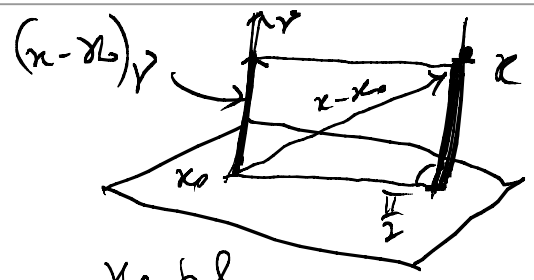
Note Title 10/27/2020



x, la proiettore

x_0 sul piano, arbitrario

$2x - 5y + 3z = 4$

è normale al vettore

$$v = (2, -5, 3)$$

$|(x-x_0)_v|$ è la distanza fra x e la sua proiezione

$\Pi \quad 2x - 5y + 3z = 4$

$v = (2, -5, 3)$

$(1,1,1) = x$

$y = 0, \; z = 0 \Rightarrow 2x = 4$

$\Downarrow \quad x = 2$

$(2,0,0)$ è un punto del piano (x_0)

$$(x - x_0) = (-1, 1, 1)$$

$$(x - x_0)_\nu = \frac{-2 - 5 + 3}{4 + 25 + 9}(2, -5, 3)$$

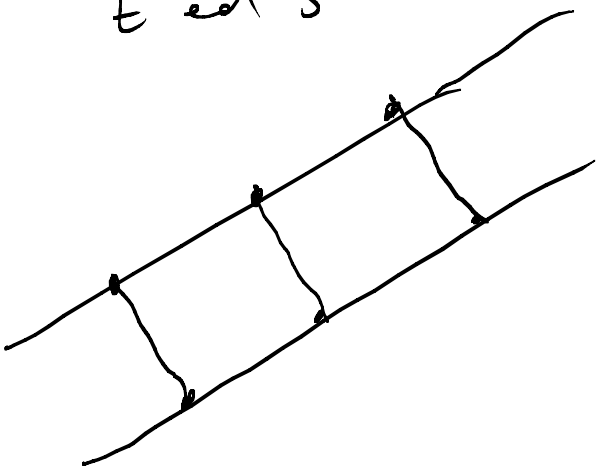
$$\left|(x - x_0)_\nu\right| = \left| -\frac{4}{38} \right| |(2, -5, 3)| = \frac{2}{19}\sqrt{4 + 25 + 9} = \frac{2}{19}\sqrt{38} =$$

$$= \frac{2}{\sqrt{19}}$$

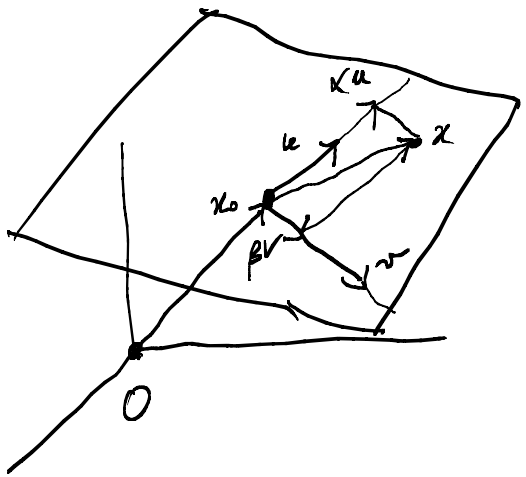
$$\rightarrow \begin{cases} \left[x_0 + \bar{t} u - (y_0 + \bar{s} v) \right] u = 0 \\ \left[x_0 + \bar{t} u - (y_0 + \bar{s} v) \right] v = 0 \end{cases}$$

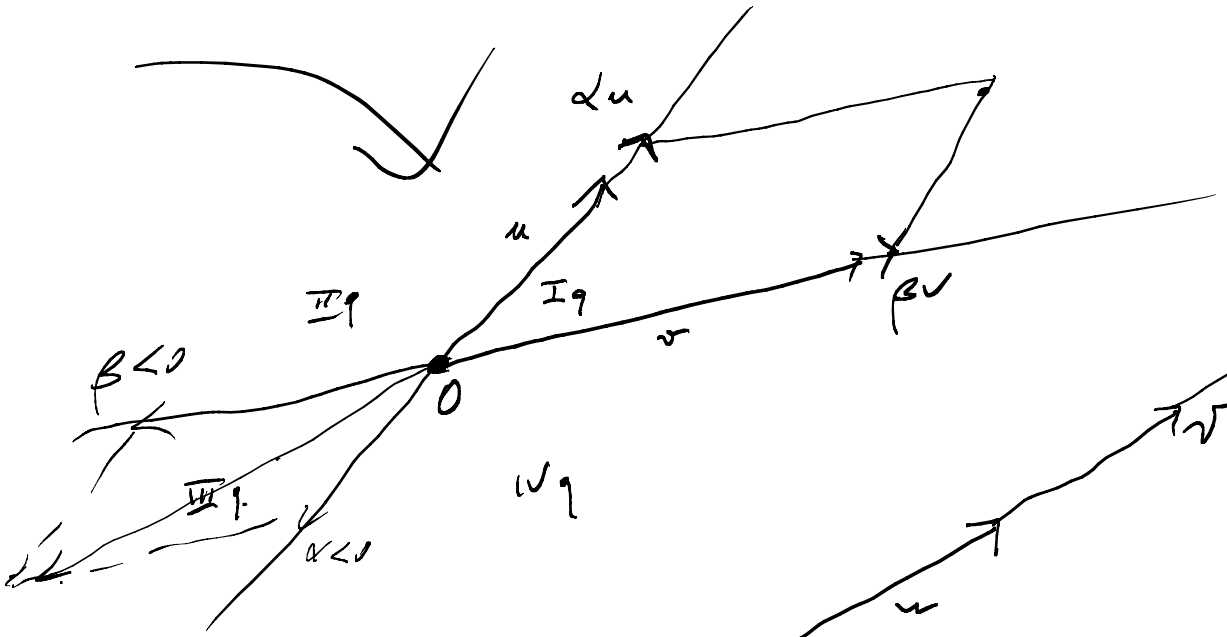
sistema di equazioni lineari nelle incognite $\bar{t}$ ed $\bar{s}$

la norma di $[\ \ ]$ è
la distanza fra le rette



G. I. ?
nel titolo
appare "distanza"





$\alpha \underline{u} + \beta \underline{v}$

$$\varphi(\alpha, \beta) = x_0 + \alpha \underline{u} + \beta \underline{v}$$

Ogni punto del piano si ottiene al variare di α e β in $\mathbb{R}$.

$$2x + y - z = 1$$

5 variabili: x, y, z, α, β

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x_0^{(1)} \\ x_0^{(2)} \\ x_0^{(3)} \end{pmatrix} + \alpha \begin{pmatrix} u_1 \\ u_2 \\ u_3 \end{pmatrix} + \beta \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix}$$

$$\begin{cases} x = x_0^{(1)} + \alpha u_1 + \beta v_1 \\ y = x_0^{(2)} + \alpha u_2 + \beta v_2 \\ z = x_0^{(3)} + \alpha u_3 + \beta v_3 \end{cases}$$

$$\begin{cases} 2x + y = 1 \\ 4x + 2y = 3 \end{cases}$$

$v_1(2,1) \quad v_2 = (4,2) \quad (4,2) = 2(2,1)$

moltiplico per 2

$$\begin{cases} \underline{4x + 2y = 2} \\ \underline{4x + 2y} = 3 \end{cases}$$

$a = b$

$c = d$

$a - c = b - d$

sottraendo alle II eq. la I, ottengo

$0 \cdot x + 0 \cdot y = 1$?!

AL_1.1

$x = x + 1$ in $\mathbb{R}$

sottraendo ad ambo i membri x si ottiene

$x - x = x + 1 - x$

$\rightarrow 0 = 1$

$B = \alpha_1 A_1 + \alpha_2 A_2 + \alpha_3 A_3$ dove α_i DATI

$B \in \langle A_1, A_2, A_3 \rangle$

$\langle (1,0,0), (0,1,0) \rangle \ni (2,1,1)$ NON È POSSIBILE

$\neq 0$

— $\sum_1^n \alpha_i x_i$ $\alpha_i \in \mathbb{R}$ Comb.n. LINEARI

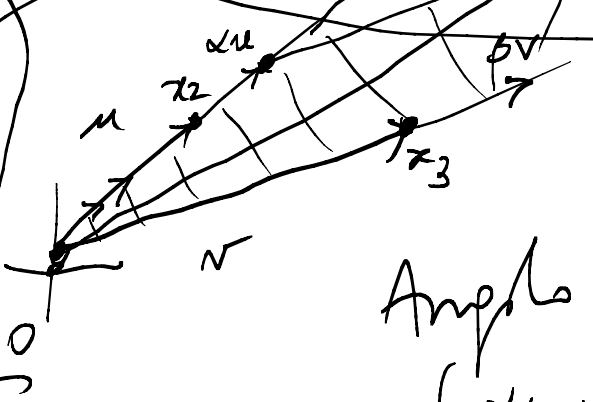
— $\sum_1^n \alpha_i x_i$ $\alpha_i \in \mathbb{R}$ soggetti $\sum_1^n \alpha_i = 1$ Combn. AFFINI

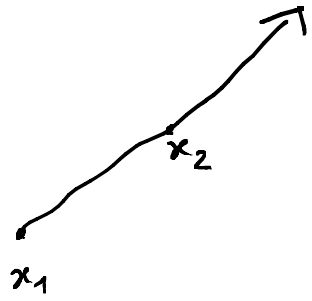
— $\left(1 - \sum_2^n \alpha_i\right) x_1 + \sum_2^n \alpha_i x_i$: $\alpha_i \in \mathbb{R}$ e ≥ 0

Comb. CONICHE

$\sum_1^n \alpha_i = 1$

tutti meno uno sono ≥ 0





$x_1 + t(x_2 - x_1) =$

$t > 0$

$= (1-t)x_1 + tx_2$

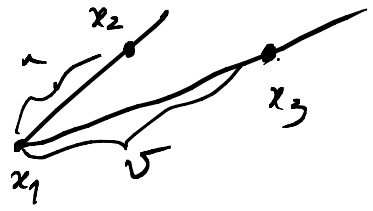
Angolo di vertice 0

$= \{\alpha u + \beta v,\ \alpha, \beta \geq 0\}$

→ angolo di vertice 0 e lati u, v

Angolo $= \{x_1 + \alpha u + \beta v\}$ → traslato portando 0 in x_1

$$x_1 + \alpha(x_2 - x_1) + \beta(x_3 - x_1) =$$



$u = x_2 - x_1$

$v = x_3 - x_1$

$$= (1 - \alpha - \beta)x_1 + \alpha x_2 + \beta x_3$$

$\alpha \geq 0$
$\beta \geq 0$

$$\boxed{(1 - \alpha - \beta) + \alpha + \beta = 1}$$

$\alpha(u,v)$ $\qquad \alpha : \Omega \times \mathbb{R}^n \to \mathbb{R} \qquad \Omega \subseteq \mathbb{R}$

Ω: sottinsieme aperto; $\mathbb{R}^n$: tutto lo spazio; dim = dim

$\forall$ fissato $\bar{u} \in \Omega$ la funzione $v \to \alpha(\bar{u}, v)$ è lineare!

Data una forma d-ff. lineare α, si dice esatta (in Ω)

se $\exists\, f : \Omega \to \mathbb{R}$: $\alpha \equiv df$ in Ω

$\alpha(u,v) = \nabla f(u) v$

$A(u) v$

$\exists f : \nabla f \equiv A$ in Ω

CAMPI E FORME

$$\begin{cases} y - z = 1 \\ y - 2z = 4 \end{cases}$$

x	y	z	
0	1	-1	1
0	1	-2	4

colonne di soli zeri

$x = 0$ in $\mathbb{R}$ soluzione unica $x = 0$

in $\mathbb{R}^2$ $1x + 0y = 0$

x	y	
1	0	0

↑ 1 colonna nulla

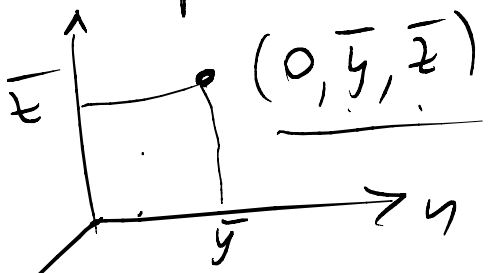
Infinite soluzioni $\{(0, y)\}$ asse y

in $\mathbb{R}^3$ $1x + 0y + 0z = 0$

x	y	z	
1	0	0	0

due colonne nulle

Infinite soluzioni $\{(0, y, z)\}$ piano yz

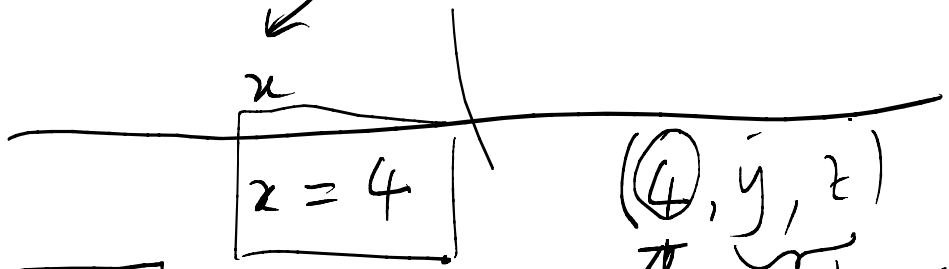


≡ l'incognita x NON APPARE ESPLICITAMENTE

0	1	-1	1
0	1	-2	4

equivale a

0	1	-1	1
0	0	-1	3

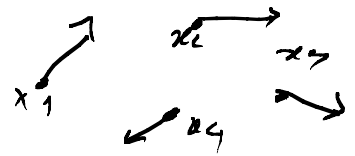


$(4, y, z)$

↑ arbitrari

AL_1.1

n particelle di posizione $x_i \in \mathbb{R}^3$, $m_i \in \mathbb{R}$



su ogni particella (punto materiale) viene esercitata una forza $F_i \ (\in \mathbb{R}^3)$. Per l'equazione di Newton ($F=ma$) applicata ad OGNI particella si ha

$$F_i = m_i \ddot{x}_i \qquad i = 1..n$$

$\ddot{x}$ = derivata seconda, cioè la derivata della derivata

Sommando membro a membro si ottiene

$$\sum_1^n F_i = \sum_1^n m_i \ddot{x}_i = \sum_1^n \left(M \frac{m_i}{M} \right) \ddot{x}_i =$$

($\frac{m_i}{M}$ percentuale della massa della part. i)

$$= M \left(\sum \frac{m_i}{M} \ddot{x}_i \right) =$$

$$= M \left(\sum_1^n \frac{m_i}{M} x_i \right)''$$

$$M = \sum_1^n m_i$$

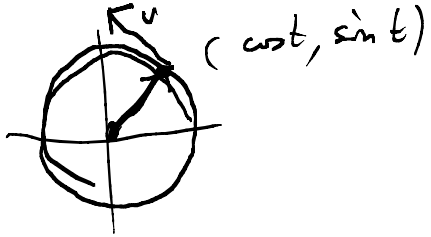
$\sum_1^n F_i$ → R, risultante delle forze (FORZA TOTALE)

M → MASSA TOTALE

$x_{C.M} = \sum_1^n \frac{m_i}{M} x_i$ ← posizione del centro di massa

$x(t) = \cos t$

$y(t) = \sin t$



$-\sin t \cos t + \sin t \cos t = 0$

$\dot{x}(t) = -\sin t$

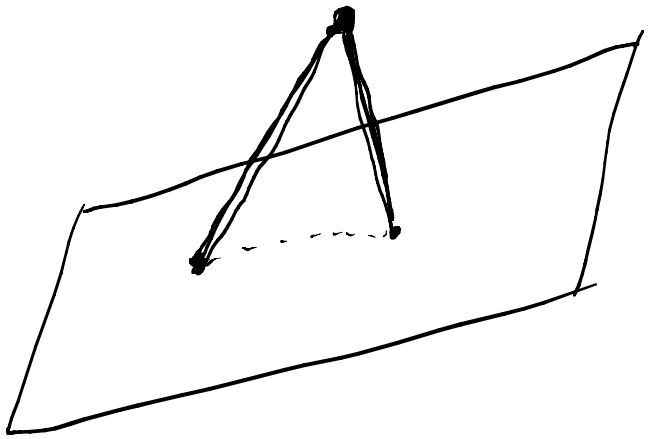
$\dot{y}(t) = \cos t$

velocità all'istante t

$\ddot{x}(t) = -\cos t$

$\ddot{y}(t) = -\sin t$

$\ddot{x} = -x$

$\ddot{y} = -y$

$\ddot{x}$ è lineare