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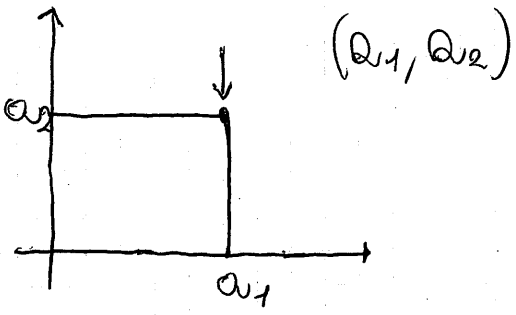
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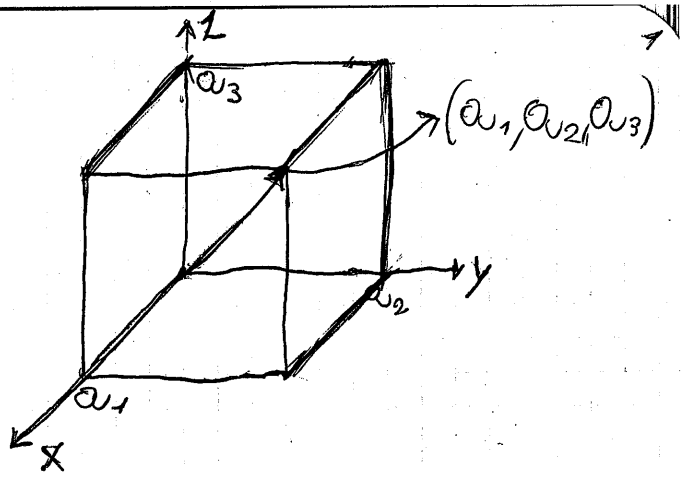
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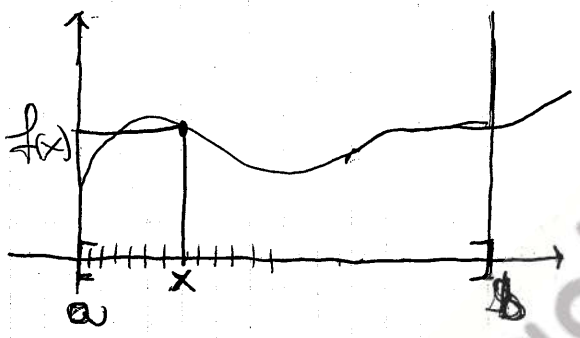
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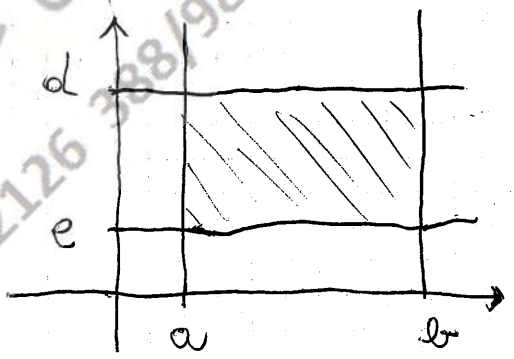


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$\mathbb{R}^m = \{a_1, \dots, a_m : a_i \in \mathbb{R} \quad \forall i = 1 \dots m\}$

$f : \mathbb{R}^2 \to \mathbb{R}$

$f : [a,b] \times [c,d] \to \mathbb{R}$



$f : [0, \pi] \times [0, 2\pi] \to \mathbb{R}^3$

$$\begin{cases} x = \sin\theta \cos\varphi \\ y = \sin\theta \sin\varphi \\ z = \cos\theta \end{cases}$$

$$\begin{cases} 1\ x = 2t \\ 2\ y = t \\ 3\ z = 3t \end{cases} \to \mathbb{R}^3$$

$t : 1 \to \mathbb{R}$

$\mathbb{R} \to \mathbb{R}^3$

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$\mathbb{R}$ = SCALARI (a) a = NUMERO

$\mathbb{R}^m$ = VETTORI (a_1, a_2, a_m) a_i = COMPONENTI

$\lambda a = (\lambda a_1, \lambda a_2, \dots, \lambda a_m)$ PRODOTTO SCALARE · VETTORE

$3(1,2,3) = (3; 6, 9)$

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$\mathbb{R}^m$ $m \in \mathbb{N}$

$= \{(a_1 \dots a_m) : a_i \in \mathbb{R} \ \forall i = 1 \dots m\}$ VETTORI

- PRODOTTO SCALARE × VETTORE

$\lambda \in \mathbb{R}$ $\rightarrow \lambda a \equiv (\lambda a_1, \lambda a_2, \dots, \lambda a_m)$

$0\,a = (0, 0, \dots, 0) \equiv 0$

$1\,a = a$ $\quad -1\,a = -a$

$\lambda(\mu a)$ $\quad \lambda, \mu \in \mathbb{R}$, $a \in \mathbb{R}^m$

$= (\lambda\mu)a$

- SOMMA DI VETTORI $\mathbb{R}^m \rightarrow \mathbb{R}^m$

$a + b \equiv (a_1 + b_1, a_2 + b_2, \dots, a_m b_m)$

$a + 0 = a \quad \forall a \in \mathbb{R}^m$

$a + b = b + a \quad \forall b, c \in \mathbb{R}^m$

$a + (b + c) = (a + b) + c$

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- PROPRIETÀ SCALARE × VETTORE

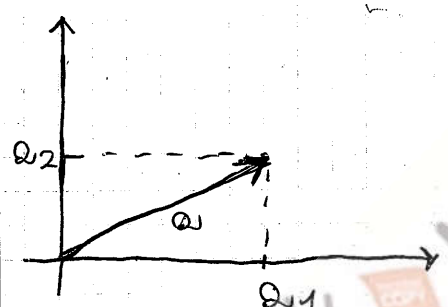
$\lambda(v+w) = \lambda v + \lambda w \quad \forall \lambda \in \mathbb{R} \quad \forall v, w \in \mathbb{R}^n$

$(\lambda+\mu)v = \lambda v + \mu v \quad \forall \lambda, \mu \in \mathbb{R} \quad \forall v \in \mathbb{R}^n$

RIEPILOGO PROPRIETÀ

SOMMA : $\mathbb{R}^n \times \mathbb{R}^n \to \mathbb{R}^n$ PRODOTTO : $\mathbb{R} \times \mathbb{R}^n \to \mathbb{R}^n$

MODULO - NORMA - INTENSITÀ - LUNGHEZZA



$v = (v_1, v_2) \quad v \in \mathbb{R}^n$

$\sqrt{v_1^2 + v_2^2} \qquad |v| = \sqrt{\sum_{i=1}^{n} v_i^2} =$

$= \sqrt{v_1^2 + v_2^2 + \dots + v_n^2}$

PROPRIETÀ

- $|v| \geq 0 \quad \forall v \in \mathbb{R}^n$
- $|v| = 0 \iff v = 0$
- $|\lambda v| = |\lambda|\,|v|$
- $|v+w| \leq |v| + |w|$

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