espacio vectorial

$v, w, u \in V$

α

β

$$u + v \in V$$

$$u + v = v + u$$

$$u + (v + w) = (u + v) + w$$

$0_v \in V$

$$v + 0_v = v$$

v

V

$(-v) \in$

$$v + (-v) = 0_v$$

$$\alpha v \in V$$

$$\alpha(u+v)=\alpha u+\alpha v$$

$$(\alpha+\beta)v = \alpha v + \beta v$$

$$\alpha(\beta v) = (\alpha\beta)v$$

$$1v = v$$

subespacio

$u, v \in V$

$\lambda \in$

$v \in V$

$\lambda v \in V$

Producto punto

$$\vec{v} = (v_1, ..., v_n)$$

$\in R^n$

$$\vec{w} = (w_1, ..., w_n)$$

$$\vec{v} \cdot \vec{w} = v_1 \cdot w_1 + ... + v_n \cdot w_n \in R$$

$$\vec{v} \cdot \vec{0} = 0$$

$$\vec{v} \cdot \vec{w} = \vec{w} \cdot \vec{v}$$

$$\vec{u} \cdot (\vec{v} + \vec{w}) = \vec{u} \cdot \vec{v} + \vec{u} \cdot \vec{w}$$

$$(\alpha\vec{v})\cdot\vec{w}=\alpha(\vec{v})\cdot\vec{w})$$

Norma

$\vec{v}$

$$||\vec{v}||$$

$$\sqrt{v \cdot v}$$

$$||B - A||$$

$\vec{v}, \vec{w}, \in R^n$

$\alpha \in R$

$$||\vec{v}|| \geq 0$$

$$||\vec{v}|| = 0$$

$$\vec{v} = 0$$

$$||\alpha\vec{v}|| = |\alpha|||\vec{v}||$$

$$||\vec{v} - \vec{w}|| = ||\vec{w} - \vec{v}||$$

$$||\vec{v} + \vec{w}|| \leq ||\vec{v}|| + ||\vec{w}||$$

$$|\vec{v} \cdot \vec{w}| \leq ||\vec{v}||||\vec{w}||$$

NOTA

$$|a||b| = |a \cdot b| \leq \frac{a^2 + b^2}{2}$$

ley de cosenos

$$\vec{v} \cdot \vec{w} = ||\vec{v}||||\vec{w}||cos\theta$$

es válido para toda dimensión

ortogonales

$$\vec{v} \cdot \vec{w} = 0$$

paralelos

π

λ

$\lambda \in R$

producto vectorial

$$\vec{u} \times \vec{v} = (u_2 v_3 - u_3 v_2)\vec{i} - (u_1 v_3 - u_3 v_1)\vec{j} + (u_1 v_2 - u_2 v_1)\vec{k}$$

$\vec{w}$

abierto

$$\forall x \in V$$

$$\exists B_r(x) \subset V$$

cerrado

$\exists x \in V$

$$\forall B_r(x) \subsetneq V$$

$$\forall B_r(x) \cap V^c \neq \varnothing$$

punto es interior

punto es de adherencia

$$\forall B_r(x) \cap A \neq \varnothing$$

R^n

$$A^\circ \subset A$$

$$A \subset \overline{A}$$

$A \subset B$

$$A^\circ \subset B^\circ$$

$$\overline{A} \subset \overline{B}$$

$$V \subset A$$

$$V \subset A^\circ$$

$$A \subset F$$

$\overline{A} \subset F$

A°

$\overline{A}$

$$A = A^\circ$$

$$A = \overline{A}$$

$$A^\circ \cup B^\circ \subset (A \cup B)^\circ$$

$\cup B)^c = A^c \cap B^c$

$$(A \cap B)^c = A^c \cup B^c$$

$$R^n x R^n \to R$$

$x, y, z \in R^n$

$$d(x, y) \geq 0$$

$$d(x, x) = 0$$

$$d(x, y) = d(y, x)$$

$$d(x, y) \leq d(x, z) + d(z, y)$$

$$d(x, y) = 0$$

$$x = y$$

métrica o distancia

bola abierta

$r > 0$

$$B_r(p) = \{r \in R^n : d(x,p) < r\}$$

bola cerrada

$$B_r(p) = \{x \in R^n : d(x,p) \leq r\}$$

$$B_r(p)$$

$$A \cup B$$

$$A \cap B$$

$$A^\circ \cap B^\circ = (A \cap B)^\circ$$

$$\overline{A} \cup \overline{B} = \overline{A} \cup \overline{B}$$

$$\overline{A \cap B} \subset \overline{A} \cap \overline{B}$$

frontera

$$\overline{A} \cap \overline{A^c}$$