7. Jorge

Given a point $z \in \mathbf{R}^n - X$ and a direction vector $\vec{v} \in S^{n-1}$, consider the ray r emanating from z in the direction of $\vec{v}$,

$$r = \{z + t\vec{v} : t \geq 0\}.$$

Check that the ray r is transversal to X if and only if $\vec{v}$ is a regular value of the direction map $u: X \to S^{n-1}$. In particular, almost every ray from z intersects X transversally.

$f: X \to Y$

$y \in Y$ es reg

$\iff f \pitchfork \{y\}$

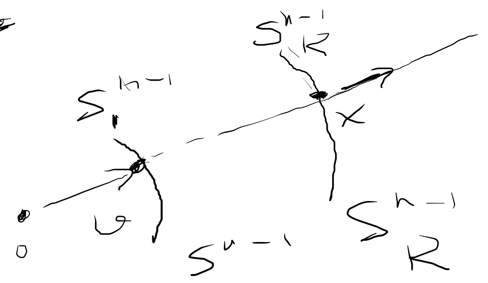
$\mathbb{R}^n \setminus \{0\} \xrightarrow{N} S^{n-1}$ $\quad \ker dN_x = T_x v$

$x \longmapsto \frac{x}{|x|} = v$

todo v es regular

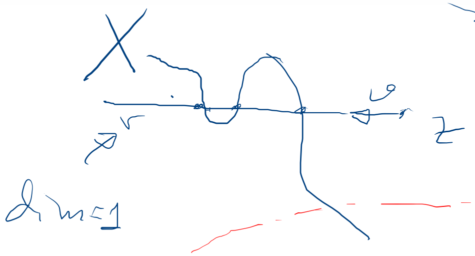
$\forall v, x \in N^{-1}(v)$, $dN: T_x\mathbb{R}^n \to T_v S^{n-1}$

es sobre



$|x| = R$

$N|_{S^{n-1}_R}: S^{n-1}_R \to S^{n-1}$



① $r \pitchfork X \iff v \in S^{n-1}$ val. reg de $u: X \to S^{n-1}$

$x \longmapsto \frac{x - z}{|x - z|}$

$X \hookrightarrow \mathbb{R}^n \setminus \{z\} \to S^{n-1}$, v, u

② c.c. $r \pitchfork X$

Sard.

v reg

$\Updownarrow$

$u \pitchfork \{v\}$

$\Updownarrow$

$X \pitchfork r$

$X \xrightarrow{f} Y \xrightarrow{g} Z$, $\quad g \circ f \pitchfork W \iff f \pitchfork g^{-1}W$

$x \mapsto y \mapsto z$, $\quad W \subset Z$

$\Updownarrow$

$w \in W$

$g \circ f \pitchfork W$

$\Downarrow$

$g \pitchfork W$

$\boxed{(dg) \circ (df) T_x X} + T_w W = T_w Z$

$\forall x \in (g \circ f)^{-1}(z)$

$\Downarrow$?

$g \pitchfork W \iff \forall y \in g^{-1}(z)$,

$\boxed{dg\, T_y Y} + T_w W = T_w Z$

Para terminar

- Jordan-Brower $\underbrace{8, 9}_{JA}, \underbrace{10, 11}_{P}$ ← Mierc.

A - Borsuk Ulam ← Viernes

? - clasif. 1-var. $\boxed{?\ JV}$