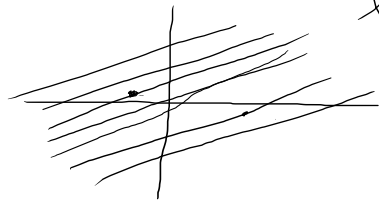


$l(x,y) = ax + by = c \quad dl = a dx + b dy$



$d(f + \varepsilon l) = df + \varepsilon dl$

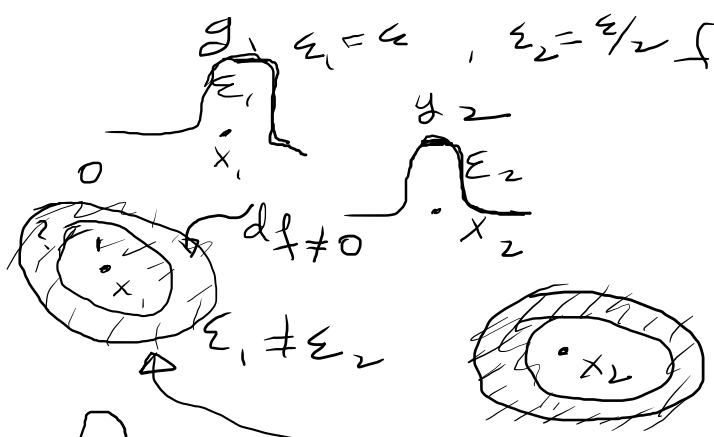
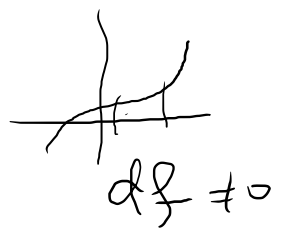
$f + \varepsilon l$

$\varepsilon l$



$l(p_1) \neq l(p_2) / \varepsilon$

$\varepsilon l(p_1) \neq \varepsilon l(p_2)$



$f + \varepsilon_1 g_1 + \varepsilon_2 g_2$

Lemma: Sea  $U \subset \mathbb{R}^n$  un abierto

y  $f: U \rightarrow \mathbb{R}$ ,  $df(x) \neq 0 \quad \forall x \in U$

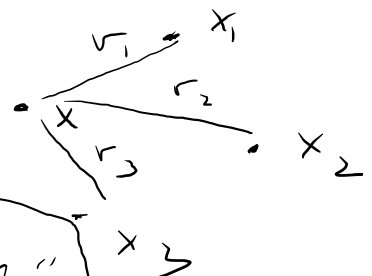
(ie,  $\forall x \in U, \exists i, t q. \frac{\partial f}{\partial x_i}(x) \neq 0$ )

Sea  $g: U \rightarrow \mathbb{R}$  otra función

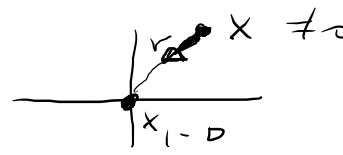
$\Rightarrow \exists \varepsilon > 0$  t.q.  $f + \varepsilon g$  tampoco tiene P.C. en  $U$ .

$$V = \sum q_i / r_i$$

$$x \neq x_i$$

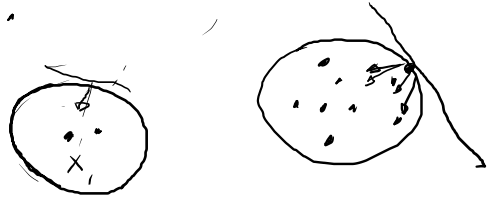
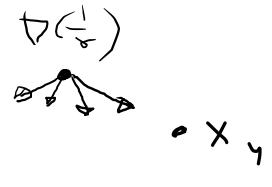
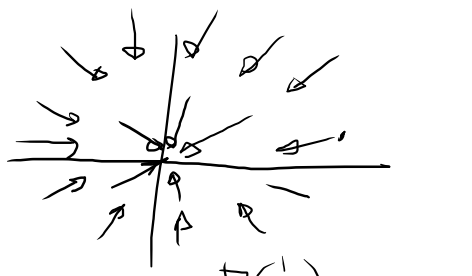


caso especial



"potencial"  
 $-\nabla \frac{1}{r} =$   
 "fuerza"

$$\frac{d}{ds} \left( \frac{1}{r} \right) = -\frac{1}{r^2}$$



$$df(x) : T_x M \rightarrow \mathbb{R}$$

?

$$\nabla f(x) \in T_x \mathbb{R}^n$$

$$T_x \mathbb{R}^n \cong (T_x \mathbb{R}^n)^*$$

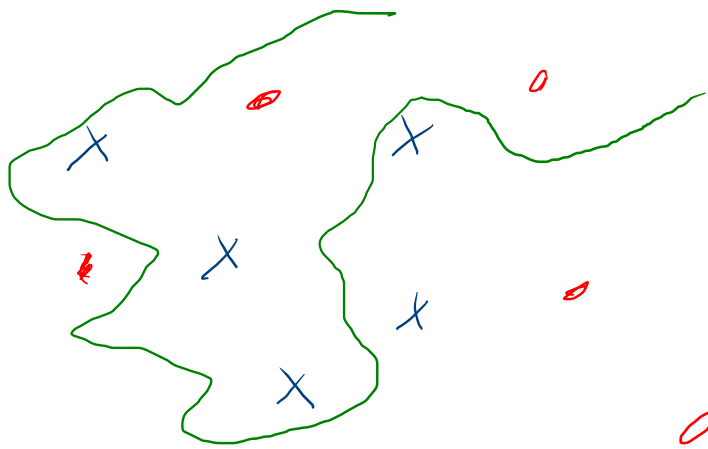
$$\omega \mapsto \omega^* \in (T_x \mathbb{R}^n)^*$$

$$\omega^*(w) := \langle \omega, w \rangle$$

$w \in T_x \mathbb{R}^n$  prod. escalar

$$\langle x, y \rangle = \sum x_i y_i$$

→ 1145



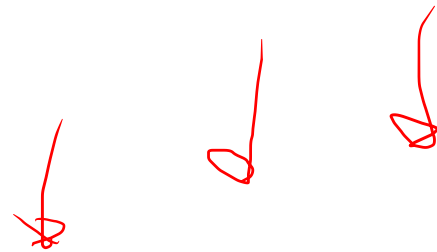
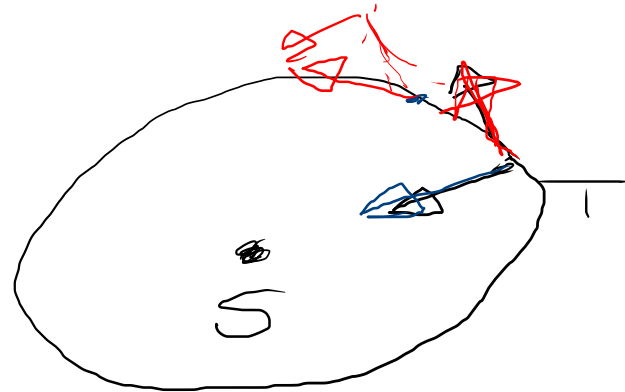
$$a_c = \frac{f}{m_c}$$

T · L

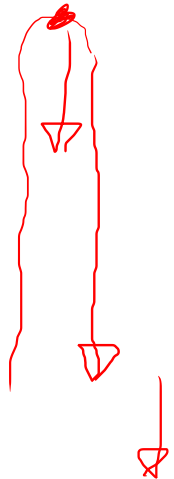
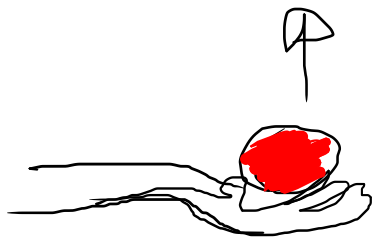
a = ?

~~S~~  
S

h



$$a = \frac{f}{m}$$



$$\nabla \frac{1}{|x|} = -\frac{x}{|x|^3}$$



$$|x| = r$$

$$\nabla \frac{1}{|x|} = -\frac{x}{|x|^3}$$