Reminder III

- Imbedding = injective immersion $M \to F(M) \subset N$ homeomorphic when $F(M)$ endowed with subspace top.
- m-submanifold property + regular submanifold
- $C^\infty(p)$ = germs at p = $\{[f] \mid f \in C^\infty(U), U \in N_p\}$

  ↑ algebra
- $T_p(M)$ = all linear maps $X_p : C^\infty(p) \to \mathbb{R}$ satisfying Leibniz rule. $T_p(M)$ = tangent plane,

  vector space

  $T_p(M) \ni X_p$ = tangent vector
- For $M = \mathbb{R}^m$, $X_p(f) \equiv v \cdot \nabla f(p)$ for $v \in \mathbb{R}^m$

  $\Rightarrow T_p(\mathbb{R}^m)$ m dimensional, basis = $\left\{ \frac{\partial}{\partial x^1}\Big|_p, \cdots, \frac{\partial}{\partial x^m}\Big|_p \right\}$.
- For $F : M \to N$ smooth map, $p \in M$

  $F^* : C^\infty(F(p)) \to C^\infty(p)$ homomorphism of algebra

  $F_* : T_p(M) \to T_{F(p)}(N)$ homomorphism of vector space

If F diffeomorphism, then F_* and $F^{-1}{}_*$ are homomorphisms ($\Leftrightarrow$ F_* isomorphism)

↑ preserves structures