1$^{\text{st}}$ Lecture (2h)

(1) Examples of groups with differentiable groups operation: $\mathbb{R}^n$, $GL_n(\mathbb{R})$ and $T_n^u(\mathbb{R})$, $\mathbb{T}^n$

(2) Notion of C^k manifold, $k \in \{0, \omega, \infty\} \cup \mathbb{N}^+$

(3) Handy definition of Riemannian manifold

(4) Handy definition of tangent vector and of vector field

(5) Example of vector fields on $\mathbb{T}^1 \setminus \{p\}$ with respect to coordinate systems $\psi_+ :]0, 2\pi[\longrightarrow \mathbb{T}^1$, $\psi_+(t) = e^{i\theta_+}$ and $\psi_- :] - \pi, \pi[\longrightarrow \mathbb{T}^1$, $\psi_-(\theta_-) = e^{i\theta_-}$.

(6) Sketchy idea of the fact that derivations corresponds to vector fields.