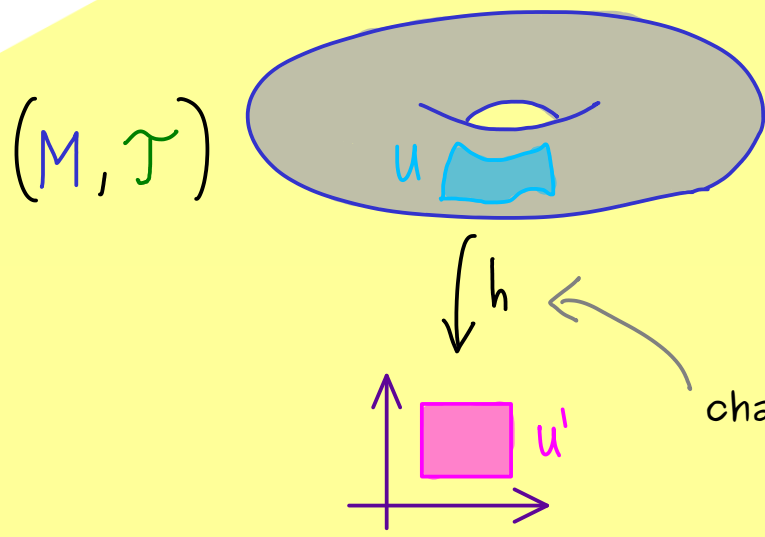




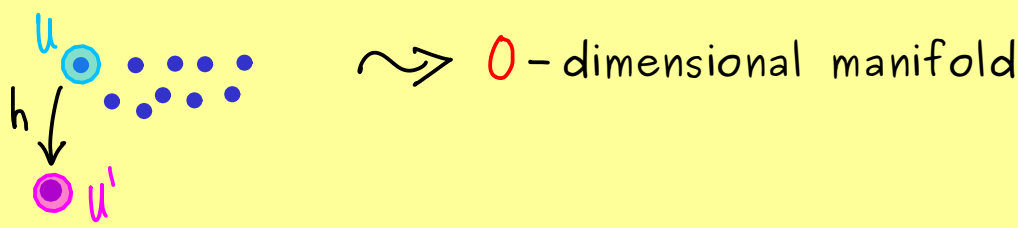
# Manifolds - Part 10



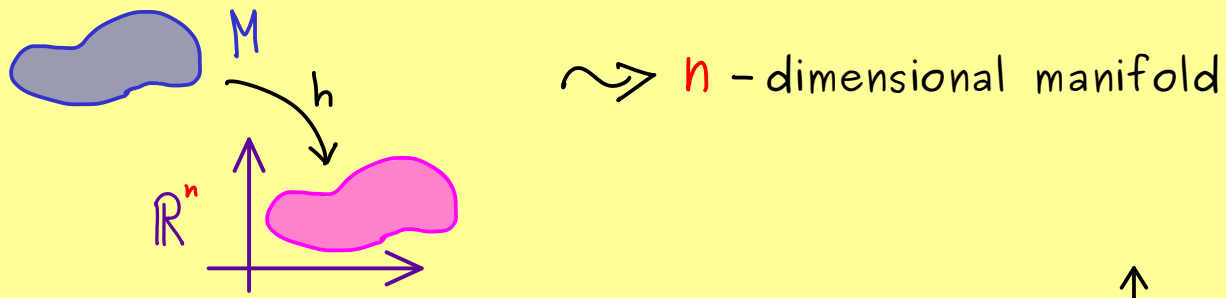
- (1) Hausdorff space
- (2) second-countable
- (3) locally Euclidean of dimension  $n$

Definition: A collection of charts  $(U_i, h_i)_{i \in I}$  is called an atlas if:  $\bigcup_{i \in I} U_i = M$

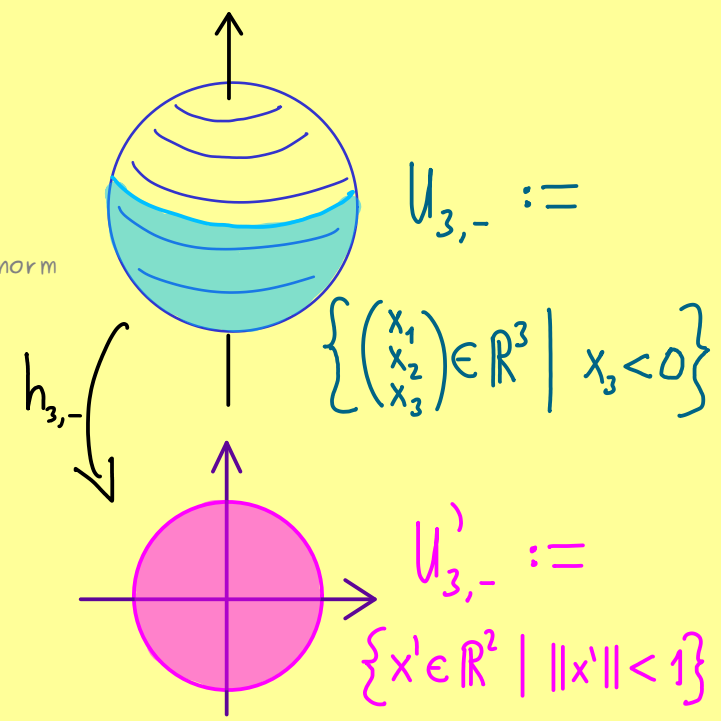
Example: (a)  $(M, \mathcal{T})$  discrete topological space with countably many points



(b)  $M \subseteq \mathbb{R}^n$  open subset, with standard topology,  $(M, \mathcal{T})$



(c)  $S^2 \subseteq \mathbb{R}^3$ ,  $S^2 := \{x \in \mathbb{R}^3 \mid \|x\| = 1\}$  2-dimensional manifold



$$h_{3,-}: \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} \mapsto \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

$$h_{3,-}^{-1}: \begin{pmatrix} x_1' \\ x_2' \end{pmatrix} \mapsto \begin{pmatrix} x_1' \\ x_2' \\ -\sqrt{1 - \|x'\|^2} \end{pmatrix}$$

$(U_{i,\pm}, h_{i,\pm})_{i \in \{1,2,3\}}$  is an atlas.