1 Topology

Given a set X, a collection τ is all subset of X is called topology on X if the collection is closed under **union** and **finite insection**
$\mathbf{X} = \{1, 2, 3\}$
$\tau = \{\emptyset, \{1, 2, 3\}\}$
τ is called topology
$(\mathbf{X}, \tau)$ is called **topological space**
(points, relation between points) is called topological space
(points, "nice" relation between points) is called manifold - **homemorphic**
(points, smooth relation between points) is called smooth manifold - **diffeomorphic**

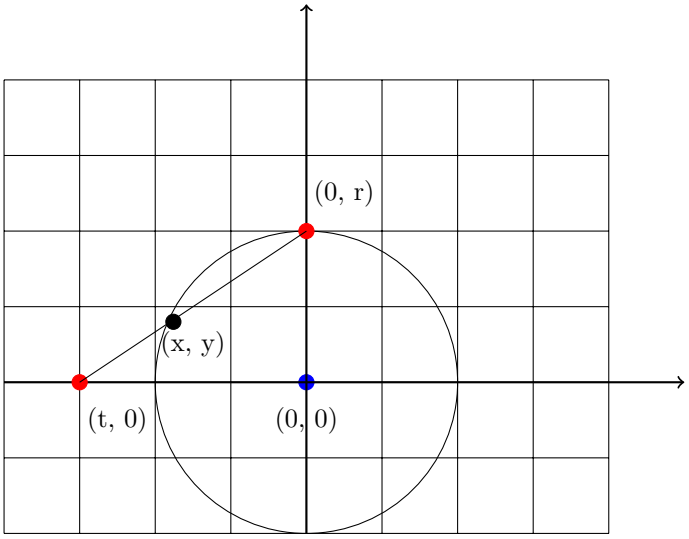
2 WTF Manifold

A $\mathcal{X}$ is defined as topological space which is Hausdorff
Hansdorff - any two different point must be in two disjoined open subsets

2.1 Chart

A chart is defined as pair $A = (U, \phi)$ U is openset in X where $\phi : U \to \mathbb{R}^n$ where ϕ is homemorphic - it is continuous and invertible
the component of $\phi = (x_1, x_2, \dots)$ are called coordinates

$$\begin{aligned} &\phi(t)t \in U \\ &= (x_1(t), x_2(t)) \\ &= (\frac{1-t^2}{1+t^2}, \frac{2t}{1+t^2}) \end{aligned}$$



2.2 Atlas

The union of all charts is called Atlas $\mathcal{A} = \cup(\phi_\alpha, U_\alpha)$

2.3 Compatiable

Two charts are called compatiable if the overlapped maps are smooth.

2.4 Manifold

A n dimension manifold is a topological space X with atlas $\mathcal{A}$