Def Topology: a topology on a set X is a collection $\mathcal{T}$ of subsets of X which has the properties:

(1) $\emptyset \subset \mathcal{T}$.

(2) The union of elements of any sub collection of $\mathcal{T}$ is in $\mathcal{T}$.

(3) similar to before $\mathcal{T}$ is also closed under intersection.

if X has a topology it is called "topological space".

we can see a topology as an ordered pair:

$$(X, \mathcal{T})$$

topological space

particular set on X.

Def: if we have the topology $(X, \mathcal{T})$ then any subset U of X is an open set if U belongs to $\mathcal{T}$.

Ej:

Parts of X

Called the discrete topology

$\mathcal{P}(X)$ is a topology on X.

$(X, \{\emptyset, X\})$ → trivial topology, indiscrete topology.

Def:

- if we have $\mathcal{T} \subset \mathcal{T}'$ or $\mathcal{T}' \subset \mathcal{T}$ we say that these topologies are comparable
- if $\mathcal{T}' \supset \mathcal{T}$ we say that $\mathcal{T}'$ is finer than $\mathcal{T}$.
  ↳ contains
- if $\mathcal{T}' \supset \mathcal{T}$ we say that $\mathcal{T}$ is coarser than $\mathcal{T}'$.
  more gruesome.