Heine Borel theorem

std. topology
$\mathcal{J}_{std.} = \{U \subset \mathbb{R}^n \mid U \text{ is a union of open ball}\}$

$A \subset \mathbb{R}^n$ compact $\Leftrightarrow$ A is closed & bounded

A topological space by giving A the subspace topology

every open cover $\{U_\alpha\}_{\alpha \in A}$ of A has a finite subcover $\{U_\beta\}_{\beta \in B \subset A}$

finite

$\exists r > 0, r \in \mathbb{R}$ s.t. $A \subset \text{Ball}(\text{origin}, r)$

as a subset of $\mathbb{R}^n$

Def: Given top. space X & subset $A \subset X$, the subspace topology on A is: $\{U \subset A \mid \exists V \in \mathcal{J}_X \text{ s.t. } U = A \cap V\}$

What is a theorem?

2 conditions:

- useful
- hard to prove

when $A = \emptyset$

$A \to P(X)$

$\alpha \mapsto U_\alpha$

$\bigcap_{\alpha \in A} U_\alpha = X$