

1. Give the set \mathbb{R} of reals its finite complement topology \mathcal{T}_{fc} , and consider a sequence in \mathbb{R} whose terms are distinct. Prove that each point of \mathbb{R} is a limit of the sequence.
2. Prove that a topological space X is Hausdorff if and only if the **diagonal** $\{(x, x) : x \in X\}$ of the product space $X \times X$ is closed.