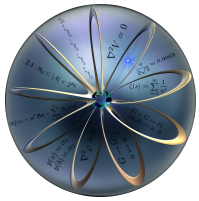

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proof of Lindelöf theorem

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Let X be a second countable topological space, $A \subseteq X$ any subset and $\mathcal{U}$ an open cover of A. Let $\mathcal{B}$ be a countable basis for X; then $\mathcal{B}' = \{B \cap A \colon B \in \mathcal{B}\}$ is a countable basis of the subspace topology on A. Then for each $a \in A$ there is some $U_a \in \mathcal{U}$ with $a \in U_a$, and so there is $B_a \in \mathcal{B}'$ such that $a \in B_a \subseteq U_a$.

Then $\{B_a \in \mathcal{B}' \colon a \in A\} \subseteq \mathcal{B}$ is a countable open cover of A. For each B_a, choose $U_{B_a} \in \mathcal{U}$ such that $B_a \subseteq U_{B_a}$. Then $\{U_{B_a} \colon a \in A\}$ is a countable subcover of A from $\mathcal{U}$.$\square$