For $\mathcal{T}$ and $\mathcal{T}'$ to be the same topology, then a subset $U \subseteq A \times B$ is open in $\mathcal{T}$ if and only if it is open in $\mathcal{T}'$. Let U be open in $\mathcal{T}$, then there exist collections $\{U_\alpha\}_{\alpha \in \mathcal{A}}$ and $\{V_\alpha\}_{\alpha \in \mathcal{A}}$ of open sets in A and B respectively where

$$U = \bigcup_{\alpha \in \mathcal{A}} U_\alpha \times V_\alpha$$

Since U_α and V_α are open in A and B respectively for all $\alpha \in \mathcal{A}$, we know that for each α, there exist open sets $U'_\alpha \subseteq X$ and $V'_\alpha \subseteq Y$where $U_\alpha = A \cap U'_\alpha$ and $V_\alpha = B \cap V'_\alpha$, but since A