In-class problems: Week 7

1. Prove that if A is a subset of a topological space X with the indiscrete topology then A is a compact subset.

2. Prove that all the subsets of $\mathbb{R}$ are compact in the cofinite topology.

3. How does compactness behave under the set operations $\cup$, $\cap$ and $\times$? For $X, Y \subset Z$ does one of the statements below imply the other?

(a) X and Y are both compact.

(b) $X \square Y$ is compact.

Here, $\square$ stands for one of the operations $\cup$, $\cap$ and $\times$.