Topology (Math 3281)

Problem Class 1   27.10.14

This set of problems will be discussed in the Problem Class on 27.10.14,
along with old homework problems.

1. Let (M, d) be a metric space and $A \subset M$. Let d_A be the metric on
   A obtained by restricting d to $A \times A$. Show that the topology of A
   coming from the metric d_A agrees with the topology coming from the
   subspace topology.

2. Let X be a set, and let $\tau = \{\emptyset\} \cup \{U \subset X \mid X - U \text{ is finite.}\}$. Show
   that X is Hausdorff if and only if X is finite.

3. Let X be a finite set. Show that a topology τ on X is Hausdorff if and
   only if it is discrete.

4. Show that $\mathbb{R}$ with the standard topology is not homeomorphic to $\mathbb{R}$
   with the discrete topology.