Topology I Math 70700 HW 2 **Fall 2019**

(1) Let τ be the standard topology on the unit interval $I = [0, 1]$ and let τ' be another topology on I.
   (a) Prove that if $\tau' \subsetneq \tau$ then I cannot be Hausdorff with the topology τ'.
   (b) Prove that if $\tau \subsetneq \tau'$ then I cannot be compact with the topology τ'.
(2) Consider the rationals $\mathbb{Q} \subset \mathbb{R}$ with the usual subspace topology.
   (a) Show that $\mathbb{Q}$ is not locally compact.
   (b) Show that the one-point compactification of $\mathbb{Q}$ is not Hausdorff.
(3) From Hatcher's notes on topology:
   (a) p42 Q 3, 8, 11
   (b) p52 Q 3, 4