Topology I Math 70700 HW 1 **Fall 2019**

(1) Let $X = \{\frac{1}{n} \mid n \in \mathbb{N}\} \subset \mathbb{R}$ and $Y = X \cup \{0\} \subset \mathbb{R}$. Show that X is discrete but Y is not in the standard topology on $\mathbb{R}$.
(2) Show that the collection $\{\{a\} \times (b, c) \subset \mathbb{R}^2 \mid a, b, c \in \mathbb{R}\}$ of vertical intervals in the plane is a basis for a topology on $\mathbb{R}^2$, which is called the vertical interval topology on $\mathbb{R}^2$. Compare this topology with the standard topology on $\mathbb{R}^2$.
(3) Q 3, 5, 11, 12 from Hatcher's "Notes on Introductory Point-Set Topology."