Name: ____________________ Score (Out of 5 points):

1. (2 points) Let $X = \{0, 1, 2\}$ be the topological space with the topology

$$\mathcal{T} = \{\varnothing, \{0\}, \{0, 1\}, \{0, 1, 2\}\}.$$

Let $(a_n)_{n\in\mathbb{N}}$ be the constant sequence $1, 1, 1, 1, \cdots$. List all elements $x \in X$ such that $(a_n)_{n\in\mathbb{N}}$ converges to x. **No justification necessary**.

2. (3 points) Let $(X, \mathcal{T}_X)$ and $(Y, \mathcal{T}_Y)$ be topological spaces, and let $f : X \to Y$ be a continuous map. Suppose that $(a_n)_{n\in\mathbb{N}}$ is a sequence in X that converges to a point $a_\infty \in X$. Show that the sequence $\Big(f(a_n)\Big)_{n\in\mathbb{N}}$ in Y converges to the point $f(a_\infty) \in Y$.