All proofs should be as short and clear as possible. If you deviate from the style of proof given in the notes you should only do so consciously and for good reason.

Exercise 11.1. Let $\mathcal{D}(\mathbb{N}) \subseteq \mathbb{N}^{\mathbb{N}}$ be the set of *non-increasing* functions. So if $f \in \mathcal{D}(\mathbb{N})$ then for all $n \in \mathbb{N}$ we have $f(n) \geq f(n+1)$. Determine the cardinality of $\mathcal{D}(\mathbb{N})$.

Exercise 11.2. Equip $\mathbb{N}$ and the open interval $(0,1)$ with their usual orderings. Determine whether there exists a order-preserving map $f \colon \mathbb{N} \to (0,1)$.

Exercise 11.3. Prove that $\aleph_0 + 2^{\aleph_0} = 2^{\aleph_0}$.

Exercise 11.4 (Hard. See Enderton, page 165.). Find a collection $\mathcal{A} \subseteq \mathcal{P}(\omega)$ such that

- $\operatorname{card} \mathcal{A} = 2^{\aleph_0}$ and
- for all $A, B \in \mathcal{A}$ the intersection $A \cap B$ is finite.