(1) Show that if $S$ is countable, and there exists a surjection $S \to T$, then $T$ is countable.

(2) Assume Problem 1 is true. Show that if $T$ is uncountable, and there exists a surjection $S \to T$, then $S$ is uncountable.
Bonus Question, Worth an Extra 10 out of 100 Points for Homework 2

[Solutions to this problem will not be released. Bonus questions tend to be more difficult than the usual course material and will not appear on any exam.]

(3) Give a bijection $f : [2]^\mathbb{N} \rightarrow [3]^\mathbb{N}$ (and explain/prove that $f$ is a bijection). [Recall that if $S, T$ are sets, $T^S$ refers to the set of functions from $S$ to $T$.]