Problem 1. State and prove the Alexander Subbase Theorem.

Problem 2. State and prove the Tychonoff Theorem.

Problem 3. Show that the Tychonoff Theorem implies the Axiom of Choice.

Problem 4. Suppose that $X$ is completely regular. Show that if $\beta X$ is metrizable, then $X$ compact metric and $\beta X = X$.

Problem 5. Let $f = z^2 : \partial I^2 \to S^1$. Show that $I^2/f$ is homeomorphic to $\mathbb{P}^2 = S^2/\{x, -x\}$.

Problem 6. Let $S = T^2 \# T^2$ be the connected sum of two tori. What is $\pi_1(S)$?