1. If $A$ is in one-to-one correspondence with $B$ and $B$ is in one-to-one correspondence with $C$, show that $A$ is in one-to-one correspondence with $C$.

2. Prove that the set of $2 \times 2$ matrices with rational entries is countable.

3. Show that the set of irrational numbers is dense in $\mathbb{R}$. (Suggestion: use proof by contradiction. If the statement is false then there exists an interval $(a, b) \subset \mathbb{Q}$. Why is this impossible?)