1. Find all irreducible polynomials of degree at most 3 over the field \( \mathbb{Z}/3\mathbb{Z} \). (4 pts)

2. Prove: if \( X \) is a finite set and \( f : X \to X \) is a function, then \( f \) is one-to-one if and only if \( f \) is onto. Show by example that this is false for infinite sets. (4 pts)

3. Show that the set \( \mathbb{Z}/2\mathbb{Z}[x] \) of all polynomials over \( \mathbb{Z}/2\mathbb{Z} \) is countably infinite. (4 pts)

4. Prove: the union of two countably infinite sets is countably infinite. (4 pts)

5. Let \( S \) be any subset of the natural numbers. Show that \( S \) is either finite or countably infinite. (4 pts)