1. Countability

Consider degree-one polynomials, i.e. polynomials of the form \( P(x) = ax + b \). Determine if the set of all degree-one polynomials is countable under the following conditions:

(a) \( a \) and \( b \) must be integers.

(b) \( a \) and \( b \) must be rational numbers.

(c) \( a \) and \( b \) are real numbers.

2. Injection, Surjection, or Bijection?

For each of the following functions from \( \mathbb{R} \) to \( \mathbb{R} \), determine whether it is an injection, surjection, bijection, or none of the above.

(a) \( f(x) = 2^x \)

(b) \( f(x) = x^2 \)

(c) \( f(x) = 2x + 1 \)
3. Union of Countable Sets
   Prove that if $A$ is countable and $B$ is countable, then $A \cup B$ is countable.

4. Another Proof
   Prove that if $A$ is uncountable and $B$ is a countable subset of $A$, then $A - B$ is uncountable.