CS 70 Discrete Mathematics and Probability Theory
Summer 2015 Chung-Wei Lin Discussion 8B

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.