**Math 3515 – Homework 2**

1. True or false
   1. If and then
   2. If is finite, then both *A* and *B* are finite
   3. If is infinite, then both *A* and *B* are infinite
2. Prove that
3. What is the cardinality of the *countable* crossproduct
4. Let P be the set of all polynomials with integer coefficients. Find .   
   Hint: Define to be the set of all polynomials of degree n with integer coefficients. Then find and finally relate the with the original set
5. Recall that a number is called algebraic if it is the root of a polynomial with integer coefficients. If a number is not algebraic, it is called transcendental. For example, all rational numbers are algebraic, so are , etc. while and (Euler’s number) are transcendental. Prove that the algebraic numbers are countable. What about the transcendentals?
6. Prove that
7. At a party there are n people milling about. Everyone shakes hands with everyone else exactly once. How many handshakes happen? Make sure to prove your answer.
8. Show that there is no rational number with

NOTE: In class we said that card(P(S)) > card(S) for any set S, but we did not prove it. Please read through Theorem 2.2.5: Cardinality of Power Sets in our online text. However, there is nothing to turn it, just read the prove. It is good for you ☺