Math 3326 Quiz 1
January 20, 2012

Instructions. Show an appropriate amount of work. That is not an issue on this quiz, but in general show enough work that I can understand your thinking. There are 15 points altogether.

(3 pts) 1. Let $A = [0, \infty)$ and $B = [-1, 1]$. Each of the following sets is an interval. Give the set in interval notation:

(a) $A \cup B$

(b) $A \cap B$

(c) $A \backslash B$

(3 pts) 2. In (a) below, give a formula for your function f. In (b) and (c), either give formulas or sketch how the graph of a function that meets the conditions might look. Then stop; do not *prove* that your functions have the required properties.

(a) Give a bijection f from $[0, 1]$ onto $[10, 50]$.

(b) Give an injective function $g : \mathbf{R} \to \mathbf{R}$ that is not surjective.

(c) Give a surjective function $h : \mathbf{R} \to \mathbf{R}$ that is not injective.

(3 pts) 3. True or false. No explanation necessary.

____ (a) Every subset of a countable set is countable.

____ (b) If A is a countable set and $f : A \xrightarrow{\text{onto}} B$ is surjective, then B is countable.

____ (c) If $A \cup B$ is uncountable, then at least one of A or B is uncountable.

(3 pts) 4. Suppose that $f : A \to B$. If H and K are subsets of B and $H \subseteq K$, prove that $f^{-1}(H) \subseteq f^{-1}(K)$. (Note: f^{-1} denotes the pre-image operation on sets; there need not be an inverse *function*.)

(3 pts) 5. Use mathematical induction to show that $1 + 3 + 5 + \cdots + (2n - 1) = n^2$ for all natural numbers n.