University of South Carolina
Math 574: Discrete Mathematics I
Section 001
Summer I 2012

Homework Set 9

Pre-Class Homework Due: 6-12
Post-Class Homework Due: 6-19

Functions Defined on General Sets

Before Class

- Read from the beginning of the section through Example 2.
- # 2

After Class

- # 3, 4 (represent the functions as arrow diagrams), 10, 34

One-to-One and Onto Functions

Before Class

- Read from the beginning of the section through Example 1.
- Read beginning from the "Onto Functions" section through Example 4.
- # 7

After Class

- # 9, 11, 13, 17, 22

Cardinality

Before Class

- Nothing for today.

After Class

- Fill in the missing parts of the following proof.

An infinite binary string is a sequence of 0's and 1's of infinite length. Let A denote the set of all infinite binary strings.

Proposition 1. *A is uncountable.*

Proof. Suppose, for the purpose of contradiction, A is countably infinite. This would mean there is a one-to-one, onto function $f : \mathbb{N} \to A$. Consider this function as a list resembling the following:

n	**f(n)**					
0	1	0	0	0	1	...
1	0	1	1	0	1	...
2	1	1	0	0	0	...
3	0	1	1	0	1	...
4	0	0	1	0	0	...
⋮			⋮			

1. Describe a binary string s that cannot possibly be on the list.
2. Why is it impossible for s to be on the list? (Why can't it be the 10^{th} string on the list? Why can't it be the 356^{th} string on the list?)
3. What contradiction do the previous two questions reveal?

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