Discrete Structures. CSCI-150. Spring 2014.

Homework 9. Due Fri. Apr 11, 2014.

Problem 1

Let $A = \{1, 2, 3, 4\}$, and $B = \{2, 4, 6\}$. List all the elements of the set

(a) $A \cap B$, (b) $B \cup A$, (c) $A \setminus B$, (d) $B \setminus A$, (e) $A \times B$, (f) $B \times B$, (g) $\mathcal{P}(B)$.

Problem 2

Draw the diagrams (as we did in class) for all bijections from A to A when

(a) $A = \{1\}$

(b) $A = \{1, 2\}$

(c) $A = \{1, 2, 3\}$

(d) For this question, either repeat the task for $A = \{1, 2, 3, 4\}$, or derive a formula for the total number of bijections from A to A, when $|A| = n$.

Problem 3

Give an example of a function $f : \mathbb{N} \to \mathbb{N}$ that is

(a) one-to-one, but not onto,

(b) onto, but not one-to-one,

(c) neither one-to-one, nor onto,

(d) onto and one-to-one (bijection), which is not the identity function $f(x) = x$.

When constructing the functions, try to define them by formulas. (Feel free to use such operations as *absolute value*, *floor*, *ceiling*, *remainder*, in addition to normal arithmetical operations).

By definition, $\mathbb{N}$ is the set of all non-negative integers: $\mathbb{N} = \{0, 1, 2, \ldots\}$.

For each function, explain why they satisfy the required conditions.

Problem 4

Is the set $\mathbb{N} \times \mathbb{N} \times \mathbb{N}$ countable or uncountable?