

# Automata Theory: Assignment 1

Due date: August 30 (Thursday)

## Problem 1 (4 points)

Consider the following sets of integer numbers:

$$S_1 = \{4, 5, 6\}$$

$$S_2 = \{i : i \text{ is even}\}$$

$$S_3 = \{i : i \text{ is divisible by } 3\}$$

For each set below, specify its elements and determine whether it is finite or infinite:

$$S_4 = S_1 \times S_1$$

$$S_5 = 2^{S_1}$$

$$S_6 = S_1 \cap S_2$$

$$S_7 = S_2 \cap S_3$$

## Problem 2 (2 points)

Prove that, if  $S_1 \subseteq S_2$ , then  $\overline{S_2} \subseteq \overline{S_1}$ .

## Problem 3 (4 points)

Prove the following equalities:

(a)  $1 + 2 + 3 + 4 + \dots + n = \frac{n \cdot (n+1)}{2}$ .

(b)  $1 + x + x^2 + x^3 + \dots + x^n = \frac{x^{n+1} - 1}{x - 1}$  (where  $x \neq 1$ ).