CS 4814: Homework 9

due Monday 11/30, 11:59pm
(late submission not possible)

Each question is worth 20 points.

We say that a language $L \subseteq \{0, 1\}^*$ is regular if there exists a regular expression $R$ such that $L(R) = L$. All languages accepted by deterministic or non-deterministic finite automata are regular. Hence if you want to show that a language is regular, it’s enough to construct a finite automata, which is sometimes easier than constructing a regular expression.

**Question 1**

Show that the following two languages are regular:

a. The set of all binary strings $x \in \{0, 1\}^*$ such that $x$ is the binary encoding of a multiple of 7.

b. The set of all binary strings that do not contain 001 as a substring.

**Question 2**

Show that every finite language $L \subseteq \{0, 1\}^*$ is regular.

**Question 3**

Show that the following language is not regular,

$$\{1^s01^t1^{\max\{s,t\}} \mid \text{integers } s, t \geq 0\}.$$