15-251: Great Theoretical Ideas In Computer Science

Recitation 3

Announcements

- Office hours and Piazza are valuable resources. If you aren't sure what a question is asking, ask on Piazza or come to OH. Don't wait until the writing session.
- At the end of the writing session, you can hand in your homework in the unsorted box in the front of the room.

Regular or Not? You Decide

Define **REGULAR** $= \{\langle M \rangle \mid$ the set of strings accepted by M is a regular language$\}$.

Show that **REGULAR** is undecidable.

Counting sheep

For each set below, determine if it is countable or not. Prove your answers.

(a) $S = \{a_1 a_2 a_3 \ldots \in \{0,1\}^\infty \mid \forall n \geq 1$ the string $a_1 \ldots a_n$ contains more 1's than 0's.$\}$.

(b) Σ^*, where Σ is an alphabet that is allowed to be countably infinite (e.g., $\Sigma = \mathbb{N}$).

Turing's Revenge

Determine whether the following languages are decidable or not. You may "use the Church–Turing Thesis" when proving your answers.

(a) $T = \{\langle M \rangle \mid$ Turing machine M accepts finitely many strings$\}$.

(b) $U = \{(\langle M \rangle, w) \mid M$ visits more than 251 distinct cells on its tape when processing $w\}$.