

Weekly Proof Questions (Sections 5.1 – 5.3)

Assigned: 3/19/2015

Due: 3/26/2015

- 1) Show that $EQ_{CFG} = \{ \langle G_1, G_2 \rangle \mid G_1 \text{ and } G_2 \text{ are CFGs with } L(G_1) = L(G_2) \}$ is undecidable.
- 2) Let $L = \{ \langle M \rangle \mid M \text{ is a Turing Machine such that } L(M) \text{ only contains even-length strings} \}$. Prove that L is undecidable.
- 3) Let $SS_{TM} = \{ \langle M_1, M_2 \rangle \mid M_1 \text{ and } M_2 \text{ are Turing Machines with } L(M_1) \subseteq L(M_2) \}$. Show that SS_{TM} is not decidable by showing that if you had a decider for SS_{TM} , you could build a decider for A_{TM} .
- 4) Show that A_{TM} is not mapping reducible to E_{TM} .
- 5) Show that the PCP is decidable over a unary alphabet, that is, over the alphabet $\Sigma = \{1\}$.
- 6) Show that the PCP is undecidable over a binary alphabet, that is, over the alphabet $\Sigma = \{0, 1\}$.
Note: In class we proved that the PCP was undecidable over a larger, fixed sized alphabet. You may use this result in your proof.