Homework 9

1. Let $\mathcal{B}$ be the set of all infinite sequences over $\{0, 1\}$. Show that $\mathcal{B}$ is uncountable, using a proof by diagonalization.

2. Recall that $EQ_{\text{CFG}} = \{ \langle G_1, G_2 \rangle \mid G_1 \text{ and } G_2 \text{ are CFGs and } L(G_1) = L(G_2) \}$. Show that EQ_{CFG} is undecidable. For this problem, you may assume that ALL_{CFG} is undecidable, as established in Theorem 5.13.

3. Show that EQ_{CFG} is co-Turing-recognizable.

4. Let $S_{\text{TM}} = \{ \langle M \rangle \mid M \text{ is a TM that accepts } w^{\mathcal{R}} \text{ whenever it accepts } w \}$. Show that S_{TM} is undecidable.