Final Exam

CS 450
Spring 2003
Craig A. Rich

In problems 1–7, prove the given Theorems. Recall that

$$L_d = \{\, \langle M \rangle \mid M \text{ doesn't accept } \langle M \rangle \,\},$$
$$L_u = \{\, \langle M \rangle w \mid M \text{ accepts } w \,\}.$$

1 **Theorem**. $L_d \not\leq_{\mathrm{m}} \overline{L_d}$.

2 **Theorem**. $\overline{L_u} \notin \mathcal{RE}$.

3 Let `Primes` be the set of binary strings that represent prime numbers.

Theorem. `Primes` $\equiv_{\mathrm{m}} \overline{\texttt{Primes}}$.

4 **Theorem**. $\{\, \langle M \rangle \mid \varepsilon \in L(M) \,\} \in \mathcal{RE}$.

5 **Theorem**. $\{\, \langle M \rangle \mid L(M) \neq \Sigma^* \,\} \notin \mathcal{REC}$.

6 **Theorem**. $L_d \leq_{\mathrm{m}} \overline{L_u}$.

7 **Theorem**. $L_u \equiv_{\mathrm{m}} L \Longrightarrow L$ is $\mathcal{RE}$-complete