# CS 682 Homework #6
# Due March 14, 2001

DEF.: Let $A \subseteq \Sigma^*$ and $B \subseteq \Gamma^*$. We say that A <u>is recursive in</u> B *iff* there exists a total TM, M, such that

$$A = L(M^B)$$

1. Prove that $\{M_i \mid M_i(-) \Uparrow\}$ is recursive in

$$MING = \{G_i \mid (\forall_j)\ [j < i \Rightarrow G_i \not\equiv G_j]\}.$$

$1^*$ For extra credit show that MING is or is not an $\leq_m$-r.e. complete set.

DEF.: A set $C \subseteq \Sigma^*$ is <u>sparse</u> *iff* there is a $k$ such that for all $n$

$$|\ \{x \mid |\ x\ | \leq n \text{ and } x \in C\}\ | \leq n^k + k.$$

2. Prove that there are no sparse complete sets, under $\leq_m^p$-reductions, for

$$EXSPACE = \cup_{k \geq 1}\ SPACE\ [2^{n^k}]$$

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