

Assignment 1

CIS 622 Computational Complexity
due April 29, 2008

1. Is

(a) $DTIME(n) = DTIME(n + 1)$?

(b) $DTIME(2^n) = DTIME(2^{n+1})$?

(c) $DTIME(2^{2^n}) = DTIME(2^{2^{n+1}})$?

2. Show that if all tally sets in NP are in P , then $EXT=NEXT$.

3. Try one of the following. They are similar to $P \neq PLS$.

(a) Show that $PSPACE \neq EXT = \bigcup_{c \in \mathbb{N}} DTIME(2^{cn})$. Note that $PSPACE \subseteq EXP = \bigcup_{k \geq 1} DTIME(2^{n^k})$

(b) Show that $PSPACE \neq QuasiP = \bigcup_{k \geq 1} DTIME(2^{\log^k n})$

4. Argue that NP is closed under \leq_m^P .

5. Show that $NP^{NP \cap coNP} = NP$.

6. Show that the following set is \leq_m^P -complete for NP

$$\{ \langle i, x, 0^m \rangle \mid M_i \text{ accepts } x \text{ within } m \text{ steps} \}.$$