HW 9 CMSC 452. Morally Due April 10

- (0 points but you MUST READ THIS) For this HW A ∈ DTIME(T(n) means that there is a JAVA program M such that
 If x ∈ A then M(x) ↓ and outputs YES.
 If x ∉ A then M(x) ↓ and outputs NO.
 On input of length n M takes O(T(n)) steps.
- 2. (5 points) What is your name? Write it clearly. Staple the HW.
- 3. (20 points) Assume $L_1 \in DTIME(T_1(n))$ and $L_2 \in DTIME(T_2(n))$. Show that $L_1 \cap L_2 \in DTIME(T_1(n) + T_2(n))$. (You can write pseudo code and note how long the program runs. We ignore multiplicative and additive constants.)
- 4. (25 points) Formally define a 1-tape Turing Machine that has three heads on the tape. (It's okay if they end up reading the same symbol.)
- 5. (25 points) A CNF-Boolean Formula is of the form

$$(L_{11} \vee L_{12} \vee \cdots \vee L_{1k_1}) \wedge \cdots \wedge (L_{m1} \vee L_{m2} \vee \cdots \vee L_{mk_m}).$$

Describe, in terms of common data structures, a way to represent an arbitrary CNF-Boolean Formula in a computer program.

6. (25 points) Let $L \in DTIME(T(n))$. Find a polynomial p such that $L^* \in DTIME(p(T(n)))$. Give the algorithm that achieves this (it can use the algorithm for $L \in DTIME(T(n))$ and should be in pseudocode).