CMSC 652 HW 6-WRITTEN Due March 11

(50 points)

If S is a statement such as $x < y$ or $3 + 9 \geq 23$ then $eval(S)$ is TRUE if the statement is true and FALSE if the statement is false.

Let $A \leq_{1-tt} B$ be defined as follows: There exists two functions in poly time f and g where $f : \Sigma^* \to \Sigma^*$ and $g : \Sigma^* \to \{T, F\}$ such that

$x \in A$ iff $(f(x) \in B) = g(x)$.

Here is the intuition: interpret $A \leq_m B$ via f as saying that I can tell if $x \in A$ by asking ONE question to B (namely $f(x) \in B$). However, once you get the information you have to use THAT answer. By contrast, $A \leq_{1-tt} B$ means we can ask a question and choose to use the information positively or negatively.

Show that if $SAT \leq_{1-tt} S$ where S is a sparse set, then $P = NP$.

CMSC 652 HW 6-ORAL Due March 13

(50 points)

Let X and Y be random variables. Prove the following:

1. $E(X + Y) = E(X) + E(Y)$
2. Markovs' Inequality: If X is non-negative $Pr(|X| \geq a) \leq \frac{E(|X|)}{a}$
3. Chebychev's inequality: $Pr(|X - \mu|) \geq k\sigma) \leq \frac{1}{k^2}$. ($\mu$ is the mean and σ^2 is the variance).

(Why am I asking you about this stuff? I will need these in a later proof in this course.)

WARNING- you may be asked to apply these to coin problems.

Th 10-11: Jesse M, Emily H, Yi Q,

Th 11:00-12:00 Casey M, Leo F, Hoseein E.

Bahadir O, Ahmed A, Ilse H - I am not free at 3:30 so we'll talk about when to meet.

(IF you want to switch around you can, but I am meeting SOME three students 10-11, SOME three students 11-12, and SOME three students 3:30-4:30.)