Theory of Computation

Homework 5
Due: 2011/01/04

Problem 1. Let $\mu \equiv E[X]$ and $\sigma^2 \equiv E[(X-\mu)^2]$ be finite. Show that

$$prob\,[\,|X-\mu| \geq k\sigma] \leq 1/k^2$$

for $k \geq 0$. (Hint: The Markov inequality: $prob[Y \geq m] \leq E[Y]/m$ if random variable Y takes on only nonnegative values and $m \geq 0$.)

Problem 2. Show that if SAT has no polynomial circuits, then coNP$\neq$BPP. (Hint: Adleman's theorem states that all languages in BPP have polynomial circuits.)