Computationally Hard Problems

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Hand-in for week: 3

Exercise 1

A yes-no-problem is in $RP_{1/10}$ if there is a polynomial p and a randomized p-bounded algorithm A such that for every input X the following holds:

True answer for X is YES then P_R[A(X, R) = YES] >= 1/10
True answer for X is NO then P_R[A(X, R) = NO] >= 1

a)

Prove that $RP_{1/10} = RP$ and $RP \subseteq BPP$
$RP_{1/10} = RP$
$RP \subseteq BPP$

If the definition of class A is a restriction of the definition of class B then we have $A \subset B$.

RP-algorithms (Monte Carlo-algorithms) have one-sided error. Which means they have a pretty good change of getting the correct result, namely at least 50%. Taken that in consideration we can there by conclude that when running the $RP_{1/10}$ 5 times we will get a success rate of 50%, there by showing that $RP_{1/10} = RP$.

The BPP algorithm's probability of answering correct should be strictly greater than 1/2. The success rate is determined by the constant ϵ. To proof that $RP \subseteq BPP$ we can boot the success probability of the RP-algorithm to at least $1/2 + \epsilon$ to show that $RP \subseteq BPP$.