Homework 6
Complexity and Advanced Algorithms

Due November 15, 2018.

Problem 1.
Problem 5.5 from the Motwani and Raghavan book.
Use the probabilisitc method to show that an expanding graph with the following properties exists.

- $|L| = |R| = n$
- Every vertex in L has a degree $n^{3/4}$ and every vertex in R has degree at most $3n^{3/4}$.
- every subset of $n^{3/4}$ vertics in L has at least $n - n^{3/4}$ neighbors in R.

(10 Points)

Problem 2. Problem 5.4 in the book by Mowani and Raghavan, from the print of year 200. The prolem is on concave functions. **(10 Points)**

Problem 3. Problem 11.1 from the book by Motwani and Raghavan. **(5 Points)**

Problem 4. In the context of the DNF counting problem, answer the following questions.

- Write an example formula with m clauses and n variables such that he uniform sampling method requries exponential time to get a good estimate.
- How does the importance sampling method become efficient for the above example.
- Write an example formula with m clauses and n variables such that he uniform sampling method requries only polynomial time (or less).
- Think of the deterministic approach to the DNF counting problem that simply uses estimates to the inclusion-exclusion principle. Specify some limitations of this method.

(10 Points)