Homework 06
Morally Due Tue March 8 at 3:30PM. Dead Cat March 10 at 3:30

1. (0 points) What is your name? Write it clearly. When is the take-home midterm due?

2. (35 points) Let $R_a(k)$ be the least $n$ such that
   \[
   \text{for all COL: } {n \choose a} \to [2] \text{ there exists a homog set of size } k.
   \]
   For this problem assume $R_2(k) \leq 2^{2k}$ (which is true).
   In class I sketched the beginning of the proof that $R_3(k) \leq 2^{2^{O(k)}}$.
   For this problem give a complete rigorous proof.
3. (35 points) Prove the following:

For all $k$ there exists $n$ such that for all $COL : (\{k, \ldots, n\}) \rightarrow \omega$ there exists either

- a LARGE homog set, or
- a LARGE rainbow set (all the numbers are colored differently).
4. (30 points) Prove the following: For all $k$ there exists $n$ such that for all $COL : \binom{\{k, \ldots, n\}}{2} \to [100]$ there exists an $H \subseteq [n]$ such that

- $H$ is a homog set, and
- $|H| \geq 2^{\min(H)}$. 