Homework 6, Morally Due Tue Apr 3, 2018

1. (0 points) What is your name? Write it clearly. Staple your HW. Listen to the three three HAMILTON-type songs on the website and be prepared to comment on them.

2. (30 points) Let $c \in \mathbb{N}$. Find a function $f$ such that the following holds, and prove it.

   For all $c$-colorings of $\binom{f(n)}{2}$ there exists a homog set of size $n$.

   SOLUTION TO PROBLEM TWO

   Omitted, will do in class.

   END OF SOLUTION TO PROBLEM TWO

3. (Extra Credit (so to impress me)) Find a function $f$ such that the following holds:

   For all 2-colorings of $\binom{\{n,n+1,\ldots,f(n)\}}{2}$ there exists a large homog set.

4. (40 points) Recall that in class we had two different proofs of the infinite 3-ary Ramsey (with 2 colors) and hence two different proofs of the finite 3-ary Ramsey. Let $c \in \mathbb{N}$.

   (a) For this problem use the proof of 3-ary Ramsey that uses 2-ary Ramsey many times and 1-ary Ramsey once: Find a function $f$ such that the following holds, and prove it.

       For all $c$-colorings of $\binom{f(n)}{3}$ there exists a homog set of size $n$.

   (b) For this problem use the proof of 3-ary Ramsey that uses 1-ary Ramsey many times and 2-ary Ramsey once: Find a function $f$ such that the following holds, and prove it.

       For all $c$-colorings of $\binom{f(n)}{3}$ there exists a homog set of size $n$.

   SOLUTION TO PROBLEM THREE

   Omitted- will do in class.

   END OF SOLUTION TO PROBLEM THREE

5. (Extra Credit (so to impress me)) Find a function $f$ such that the following holds.

   For all 2-colorings of $\binom{\{n,n+1,\ldots,f(n)\}}{3}$ there exists a large homog set.
6. (30 points) Let $a \in \mathbb{N}$, with $a \geq 3$. Find a function $f$ such that the following holds, and prove it.

For all 2-colorings of $\binom{f(n)}{a}$ there exists a homog set of size $n$.

(You may need to use induction on $a$.)

**SOLUTION TO PROBLEM FOUR**

Omitted, will do in class.

**END OF SOLUTION TO PROBLEM FOUR**

7. (Extra Credit (so to impress me)) Let $a \in \mathbb{N}$ with $a \geq 3$. Find a function $f$ such that the following holds.

For all 2-colorings of $\binom{n,n+1,\ldots,f(n)}{a}$ there exists a LARGE homog set.