

Homework 3, Morally Due Tue Feb 20, 2018

COURSE WEBSITE: <http://www.cs.umd.edu/~gasarch/858/S18.html>

(The symbol before gasarch is a tilde.)

1. (0 points) What is your name? Write it clearly. Staple your HW. When is the midterm tentatively scheduled (give Date and Time)? If you cannot make it in that day/time see me ASAP.

2. (50 points) You may assume the 2-ary can ramsey theory. Recall the statement of the 3-ary Can Ramsey Theorem:

For all ω -colorings of $\binom{N}{3}$ there exists a set $I \subseteq \{1, 2, 3\}$ such that

$$COL(x_1, x_2, x_3) = COL(y_1, y_2, y_3) \text{ iff } (\forall i \in I)[x_i = y_i].$$

(We assume $x_1 < x_2 < x_3$ and $y_1 < y_2 < y_3$.)

Prove the 3-ary can Ramsey theory using a proof similar to Milet's of 2-ary can Ramsey. (the one that DOES NOT use 4-ary or 3-ary hypergraph Ramsey).

3. (50 points) This problem is a proof technique in search of a theorem.

Let X be a countable set of points in the plane. Color each pair by the *slope* of the line they form. Apply the Canonical Ramsey Theorem to this coloring.

- (a) Use the idea in the last paragraph to formulate a theorem.
- (b) Try to make an assumption about the points that leads to a more interesting theorem.

4. (0 points but please do as I'll ask about it in class). What did you think of the song *A finite simple group of order two* by the Klein Flour? (Link is on the website). Compare and Contrast to the BW-Rap in terms of both lyrics and singing ability.