Homework 07, Morally Due 12:30PM, Tue Mar 24 2026

1. (0 points) What is your name?

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2. (35 points) Prove the infinite 4-ary Ramsey theorem:

   For all COL: $\binom{\mathsf{N}}{4} \to [2]$ *there exists an infinite homog set.*

   Do the proof where at every stage you use the infinite 3-ary Ramsey Theorem (so you use the infinite 3-ary Ramsey Theorem infinitely often) and then at the end you use the 1-ary Ramsey Theorem once.

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3. (30 points) Prove the finite 4-ary Ramsey theorem:

   $\forall k)(\exists n)$ *such that* $\forall$) COL: $\binom{[n]}{4} \to [2]$ *there exists a homog set, size* k.

   Also give an upper bound on n as a function of k. The bound should be reasonable (e.g., NOT the TOWER function).

   You may use the following approximation of the finite 3-ary Ramsey Theorem:

   $\forall$) COL: $\binom{[n]}{3} \to [2]$ *there exists a homog set of size* $\geq \log(\log(n))$.

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4. (35 points)

(a) THIS IS NOW EXTRA CREDIT SINCE THE PROOF I HAD IN MIND DOES NOT WORK.
Find XXX such that the following is true, and prove it.

Let $\mathrm{COL}'\colon \binom{\mathsf{N}}{2} \times \mathsf{N} \to [10^{100}]$. *Show that there exists infinite sets* $A, B \subseteq \mathsf{N}$ *such that* COL' *restricted to* $\binom{A}{2} \times B$ *only uses XXX colors.*

(b) Find c such that the following is true, and prove it.

Let $\mathrm{COL}\binom{\omega+\omega}{3} \to [10^{100}]$. *Show that Then there exists an infinite c-homogenous set.* that is order equivalent to $\omega + \omega$.
ADDED LATER: c CAN BE A FUNCTION OF XXX FROM PART 1. FOR EXAMPLE YOU CAN SAY $c = XXX^2$.
(Hint: Use Part a. Thats why its there!)

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5. (0 points, but you must answer it)

   As I told you in class, I wrote *I can see for miles and miles* as a song about the infinite hat game, but then sold it to *The Who* who changed the lyrics.

   My lyrics are part of these slides:

   `https://www.cs.umd.edu/~gasarch/COURSES/752/S26/slides/miles.pdf`

   Their lyrics are in this youtube video of the Who singing it:

   `https://www.youtube.com/watch?v=FWt1adCTnd4`

   Listen to their version and my version as sung by *Bad Sequence*.

   Whose version to you prefer?

   Consider:

   - **My version** is about the infinite hat game.
   - **The Who's** version has the viewpoint of a guy who thinks his girlfriend is cheating on him but warns her that he knows since, as he puts it, *I can see for miles and miles...*
   - **The Who** played for the Superbowl halftime show in 2010. The past.
   - **Bad Sequence** will play for the Superbowl halftime show in 2027. The future!
   - **The Who** has great backup singers, and had musical accompaniment.
   - **My version** had neither of those.

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6. (0 points, but you must answer it)

   I got the idea for the skit, where Amedeo is confused about the rock band being *The Who* from a famous (or is it?) comedy routine called *Who's on first* It was performed by the comedy duo Abbott and Costello.

   Here it is on You Tube

   `https://www.youtube.com/watch?v=5FsJe4DScDs`

   a) Listen to it. (I am NOT going to ask what's better theirs or mine, since it's MUCH better, and they were first, unlike the song *I can see for miles and* ... where I was first).

   b) Name all of the players that are mentioned in the routine.

   c) Here is my question: Have you heard it before? Also include if you've lived in America since you were 10 (see comment below for why I want to know).

   I ask since it was, at one time, *Who's on First* was the most famous comedy routine in America. I suspect it has long faded. I am curious to get data on that, and also correlate with people living in America for a long or short time.