Homework 12
Morally Due Tue May 3 at 3:30PM. Dead Cat May 5 at 3:30
WARNING: THE HW IS TWO PAGES LONG

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

2. (50 points) Let $VDW(k,c)$ be the statement

   There exists $W = W(k,c)$ such that for all $\mathrm{COL}\colon [W]\to[c]$ there exists $a, d \geq 1$ such that

   $$a, a + d, \ldots, a + (k - 1)d \ \textit{are the same color} \ .$$

   Let $W(k,c)$ be as in the statement.

   AND NOW FOR THE PROBLEM

   Assume $(\forall c)[VDW(9,c)]$. Prove VDW$(10,2)$. Your proof should give an upper bound on $W(10,2)$ as a function of $W(9,c)$.

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3. (50 points) In this problem you will do PART of the proof of
   $(\forall k)[\text{PVDW}(x, x^2, x^2 + x, \ldots, x^2 + kx)]$.

   (a) (20 points) State carefully the LEMMA that will imply
       $(\forall k)[\text{PVDW}(x^2, x^2 + x, \ldots, x^2 + kx)]$.

   (b) (30 points) Prove carefully the BASE CASE of that lemma.

   (c) (0 points, but good for your enlightenment) Prove the Induction
       Step of the lemma.

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