Kyle Furry
Math 475

HW Due wed

(12) email me jpg picture of yourself

(13) Suppose $A \subseteq \{1, 2, \cdots, 12\}$ and $|A| \geq 9$

a) prove there is x such that $x, x+1, x+2$ are in A

b) Show by example $|A| = 8$ is not good enough to prove a)

(12) done

(13) a) lets partition A s.t. $A = B_1 \cup B_2 \cup B_3 \cup B_4$

or where $B_1 \subseteq \{1,2,3\}$, $B_2 \subseteq \{4,5,6\}$, $B_3 \subseteq \{7,8,9\}$, $B_4 \subseteq \{10,11,12\}$

By the pigeon hole principle, because we have 9 or more elements and 4 containers, then atleast 1 partition will have 3 elements in it. No matter which partition has 3 there will exist an X s.t $X, X+1, X+2$ are in A

b) A counter example is $1,2,4,5,7,8,10,11 \in A$.

Dustin Wilke
Homework 7

(12) Emailed from dnwilke@wisc.edu

(13) Suppose $A \subseteq \{1,2,3,\dots,12\}$ & $|A| \geq 9$
(a) Prove that there must be an integer x such that $x, x+1, x+2$ are all in A.
(b) Give an example of an A with $|A|=8$ for which there is no such x.

[proof] (a) By setting $|A|=9$, there are 3 numbers left over in the ordered set $\{1,2,\dots,12\}$. These numbers act as partitions of A & create 4 disjoint subsets, call them B_1, B_2, B_3, B_4, of A.

ok

Claim: One B_i has size of at least 3 (i.e., there are at least 3 sequential numbers in that B_i).
Since we know $|B_1|+|B_2|+|B_3|+|B_4|=9$, it is impossible for one of the B_i's to not have size of at least 3. If $|B_1|=|B_2|=|B_3|=|B_4|=2$, then $|A|=8$. However, we chose $|A|=9$. Therefore one of the B_i's has size of at least 3 & $x, x+1, x+2 \in A$. ∎

ok (b) For $|A|=8$, choose $1,2,4,5,7,8,10,11$. Then no $x, x+1, x+2 \in A$.