Staple!

Team W____

Sets and Logic
MHF3202 7860

Home-W

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Touch: 4Aug2016

Due **BoC, Monday, 23Feb2015**, with *all team-members present.* Please write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

This sheet is "Page $1/N$", and you've labeled the rest as "Page $2/N$",..., "Page N/N". Fill-in [large handwriting] *on this problem-sheet* all of your blanks.

W1: *Henceforth, show no work. Simply fill-in each blank on the problem-sheet.*

___ ___ a Define G:[1 .. 12]↻ where $G(n)$ is the number of letters in the n^{th} Gregorian month. So $G(2) = 8$, since the 2^{nd} month is "February". The only fixed-point of G is .... The *set* of posints k where $G^{\circ k}(12) = G^{\circ k}(7)$ is ....

___ ___ b We consider binrels on $\Omega :=$ Stooges $:= \{M, L, C\}$. There are .... **Anti-reflexive** binrels, and .... **Reflexive** binrels, and .... **Symmetric** binrels. The number of **strict total-orders** is ....

___ ___ c Suppose **R** is a binrel on set Ω. Then statement "*Relation* $\mathbf{R} \circ \mathbf{R}^{-1}$ *equals* $\mathbf{R}^{-1} \circ \mathbf{R}$" is *T* *F*

OYOP: *Your 2 essay(s) must be* TYPESET, *and Double or Triple spaced. Use the* Print/Revise↻ *cycle to produce good, well thought out, essays. Start each essay on a* ***new*** *sheet of paper. Do* **not** *restate the problem; just solve it.*

On the essays: *I ask that you do more than what I ask you to do.*

W2: Note $f(n) := \frac{1}{2}\cdot[11^n + 15^n]$ is an integer. Prove, for each *odd* $n \geqslant 3$, that $f(n)$ is composite. [*Hint:* Look at $f(n)$ mod something.]

[Are all the hypotheses necessary, or can some be weakened?]

W3: [A dodecahedron is a convex polyhedron having 12 faces, 20 vertices and 30 edges; the faces are pentagons.] Two vertices of a regular dodecahedron are ***neighbors*** if they are distinct vertices of a common pentagon. [Each vertex has $[3 \cdot 4] - 3 = 9$ neighbors.] Write $v \sim w$ to indicate that v and w are neighbors. Easily, $\sim$ is symmetric, and anti-reflexive. You can check that $\sim$ is not transitive.

A ***labeling*** of a regular dodecahedron assigns, to each vertex, a *positive integer.* A labeling is ***legal*** IFF *no* pair $v \sim w$ of vertices is assigned the same label.

i Prove there is no legal labeling with vertex sum [the sum of the 20 labels] equaling 59.

ii Let $\mathcal{S} \subset \mathbb{Z}_+$ be the *set* of sums obtainable from legal-labelings. Characterize, with proof, $\mathcal{S}$; you will likely need to construct some particular legal-labelings. [You showed, above, that $\mathcal{S} \not\ni 59$.]

End of Home-W

W1:	___ ___	85pts
W2:	___ ___	75pts
W3:	___ ___ ___	105pts
Ouch!, scratch work handed-in; OR Poorly stapled. :	___ ___	−20pts
Total:	___ ___ ___	265pts

HONOR CODE: *"I have neither requested nor received help on this exam other than from my team-mates and my professor (or his colleague)."* *Name/Signature/Ord*

.... Ord: ____

.... Ord: ____

.... Ord: ____