Math 330 Section 2 - Spring 2017 - Homework 04

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Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by this date.

B/G (Beck/Geoghegan) Textbook:
all of ch.1 - ch.3

MF lecture notes:
- **a.** ch.1 - ch.2,
- **b.** ch.4 until before ch.4.2.2 (function def.),
- **b.** ch.16.1.2 (formerly ch.16.1.1).

B/K lecture notes (optional reading – good for examples, improved understanding):
ch.1, section 1

New reading assignments:

Reading assignment 1 - due Monday, January 30:
- **a.** Read carefully the remainder of MF ch.4. This is important as it covers the definition of a function!
- **b.** Read carefully MF ch.16.1 (addenda to B/G ch.1) and ch.16.4 (addenda to B/G ch.4).
- **c.** Read carefully B/G ch.5,
- **d.** Suggested (for examples): Read B/K ch.4.1: (Set Ops) and ch.4.2: Properties of Functions.

That's a lot of pages but the MF doc reading is mostly examples.

Reading assignment 2 - due: Tuesday, January 31:
B/G: Read carefully ch.4.1-4.2.

Reading assignment 3 - due Wednesday, February 1:
B/G: Read carefully ch.4.3-4.4.

Reading assignment 4 - due Friday, February 3:
- **a.** MF doc: Read **carefully** ch.5.1 and read the remainder of ch.5.
- **b.** MF doc: Read carefully ch.6. It is very brief but extremely important and rather terse.

General note on written assignments: Unless expressly stated otherwise, to prove a proposition or theorem you are allowed to make use of everything in the book up to but NOT including the specific item you are asked to prove.

Written assignment 1: Prove B/G Prop. 4.6(iii) using induction: Given the definition of "Power" between props 4.5 and 4.6, prove that if $b \in \mathbb{Z}$ and $m, k \in \mathbb{Z}_{\geq 0}$ then

$$(b^m)^k = b^{mk}$$

You may use everything up to and including Prop.4.6(ii). Note that the proof of Prop.4.6(ii) provides an excellent template for your own proofs using induction.

Written assignment 2: Prove B/G Prop. 4.7(i) using induction: Let $k \in \mathbb{N}$. Then $5^{2k} - 1$ is divisible by 24.

You may use everything up to but not including Prop.4.7.

Written assignment 3: Prove B/G Prop. 4.16(i) by induction on c: Let $(x_j)_{j\in\mathbb{N}}$ be a sequence in $\mathbb{Z}$ and let $a, b, c \in \mathbb{Z}$ such that $a \leq b < c$. Then

$$\sum_{j=a}^{c} x_j = \sum_{j=a}^{b} x_j + \sum_{j=b+1}^{c} x_j .$$

For this proof use the generalized definition of "Σ" given in MF ch.16.4.1 instead of the one given in B/G p.34, 35!

Hints: Think carefully about the base case.