Math 330 Section 6 - Fall 2019 - Homework 05

Published: Thursday, September 12, 2019 *Running total:* 24 *points*
Last submission: Friday, September 27, 2019

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by Friday, Sept. 13.

B/G (Beck/Geoghegan) Textbook:
ch.1, ch.2.1 – 2.3, ch.3, ch.5,

MF lecture notes:
ch.2, ch.3, ch.5, ch.6.1 and ch.6.2, skim ch.6.3

B/K lecture notes:
ch.1.1 (Introduction to sets) (optional)
ch.1.2 (Introduction to Functions) but skip ch.1.2.4: Floor and Ceiling Functions (optional)

New reading assignments:

Reading assignment 1 - due Monday, September 16:

a. Read carefully MF ch.6.4 through ch.6.8.

Reading assignment 2 - due: Wednesday, September 18:

a. Read carefully the remainder of B/G ch.2. There should be nothing you have not already encountered in MF ch.3 and ch.6.
b. Carefully read B/G ch.4. You have seen almost all of it in MF ch.6.

Reading assignment 3 - due Friday, September 20:

a. Carefully read MF ch.6.9 through 6.12.

Written assignments:

> **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:
Negate the following statement (see B/G ch.3.3):

$\forall \varepsilon > 0 \; \exists \delta > 0$ such that $\forall x \in N_\delta(a)$ it is true that $f(x) \in N_\varepsilon(f(a))$.

Written assignment 2:
Prove B/G Prop. 4.7(i) by induction: Let $k \in \mathbb{N}$. Then there exists $j \in \mathbb{Z}$ such that $5^{2k} - 1 = 24j$. In other words, $24 \mid (5^{2k} - 1)$ according to MF def.6.11 in ch6.4 (Divisibility) or the definitions that follow B/G prop.1.14.

Written assignment 3: Prove MF Prop. 6.3.1 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

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

Hints: Think carefully about the base case: If $a = 5$ and $b = 8$, how would you choose c? If $a = -4$ and $b = 8$, how would you choose c? For general $a \leqq b$, how would you choose c?