

## Math 330 Section 2 - Fall 2018 - Homework 04

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*Running total: 20 points*

### Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete so far:

B/G (Beck/Geoghegan) Textbook:  
Preface and ch.1 – ch.2

MF lecture notes:  
ch.1 – ch.3

B/K lecture notes (optional but **very useful for hwk 3**):  
ch.1.1 (Introduction to sets)  
ch.1.2 (Introduction to Functions) but skip ch.1.2.4: Floor and Ceiling Functions

### New reading assignments:

#### Reading assignment 1 - due Monday, September 3:

- Read carefully B/G ch.3 on some points of logic. It is short and not overly formulaic, but it is very important that you work through its contents, in particular, the difference between  $\forall \dots \exists \dots$  and  $\exists \dots$  such that  $\forall \dots$ , and how to negate a statement with quantifiers.
- Read carefully MF ch.5.1, ch.5.2.1 and ch.5.2.2.

#### Reading assignment 2 - due: Wednesday, September 5:

- Read carefully the remainder of MF ch.5.

#### Reading assignment 3 - due Friday, September 7:

- Read carefully B/G ch.5. None of that material should be new to you.

**Written assignment 1** (MF exercise 2.10): Use induction on  $n$  to prove (2.32) of MF prop.2.5:

Let  $A_1, A_2, \dots$  and  $B$  be sets. If  $n \in \mathbb{N}$  then  $\left( \bigcap_{j=1}^n A_j \right) \cup B = \bigcap_{j=1}^n (A_j \cup B)$ .

**Hint:** Use formulas (2.12) and (2.30) (and **refer to them** when you use them!)

**Written assignment 2:** Let  $K \in \mathbb{N}$  such that  $K \geq 2$  and  $n \in \mathbb{Z}_{\geq 0}$ . Prove by induction that  $K^n > n$ .

**Hint:** Consider  $K$  as “undetermined but fixed”, i.e., as constant. Induction is done on  $n$  (only)!

**Written assignment 3:** 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  $f(x) \in N_\varepsilon(f(a))$ .