

## Math 330 Section 3 - Fall 2017 - Homework 13

*Published: Thursday, October 26, 2017*  
*Last submission: Friday, November 10, 2017*

*Running total: 49 points*

### 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.6, ch.7 (skip after thm.7.17), ch.8 – 12, ch.13.1 .

MF lecture notes:

ch.1; ch.2 except optional ch.2.2.1 (Rings & Algebras of Sets),  
ch.4 – 7,  
ch.8, except: Skip the proofs of prop.8.13, 8.14, 8.15, cor.8.2, thm.8.2;  
ch.13.1 up to and including example 13.5,  
ch.16 (Addenda to B/G): the chapters corresponding to what has been assigned from B/G.

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)

Other:

Stewart Calculus 7ed - ch.1.7: "The Precise Definition of a Limit". If you have a newer or older edition then you may have to search through the table of contents and/or consult the index.

### New reading assignments:

#### Reading assignment 1 - due Monday, October 23:

- a. Read carefully the end of B/G ch.13. Lots of overlap with MF ch.7!
- b. Linear algebra prerequisites: Read MF ch.9.1 and 9.2.1. If you are taking or have previously taken Math 304 then all of this should be familiar. If you are taking or have previously taken Math 323 then all of ch 9.1 should be familiar in dimensions 2 and 3.

#### Reading assignment 2 - due: Wednesday, October 18:

- a. Linear algebra prerequisites part 2 (OPTIONAL): If you have not taken Math 304 then review the following from the lecture notes from Paul Dawkins on linear algebra (see bottom of course materials page):
  - Vector Spaces, p.182, def. 1,
  - Subspaces p.193: def.1, thm 1,
  - Span, p.202: def 1, def 2, thm 1,
  - Linear independence, p.210: def.1,
  - Basis and dimension, p.220: def.1, thm 2, def 2, thm 3.
- b. Read carefully MF ch.9.2 (Normed Vector Spaces)

#### Reading assignment 3 - due Friday, October 20:

- a. Read carefully the beginning of MF ch.10 through 10.1.3 (Neighborhoods and Open Sets)

**Written assignment 1:**

Use anything up-to and including MF thm.7.2 and anything in B/G ch.13 to prove MF cor.7.3:

Let the set  $X$  not be countable and let  $A \subseteq X$  be countable. Then its complement  $A^c$  is not countable.

**Written assignment 2:**

Let  $X$  be a set which contains at least 2 elements. Prove that  $X^{\mathbb{N}} = \{(x_n)_{n \in \mathbb{N}} : x_j \in X \forall j \in \mathbb{N}\}$  (the set of all sequences with values in  $X$ ) is uncountable. Do this by emulating the proof of B/G thm.13.22 or MF thm.7.4. (The real numbers are uncountable). Do not use other results about uncountable sets!