

Math 330 Section 3 - Fall 2017 - Homework 05

Published: Thursday, September 7, 2017
Last submission: Monday, September 25, 2017

Running total: 22 points

Correction: Last submission date has changed from Friday, September 22 (Rosh Hashanah)

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.2 except the material on $\gcd(m, n)$, all of ch.3 - 5

MF lecture notes:

ch.1; ch.2 except optional ch.2.2.1 (Rings & Algebras of Sets),

ch.4 (Functions and relations) of the MF document up to and including ch.4.2.5 (Operations on Real Functions)

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)

New reading assignments:

Reading assignment 1 - due Monday, September 11:

- a. Read carefully the remainder of MF doc ch.4.
- b. Read carefully MF doc ch.5.

Reading assignment 2 - due: Wednesday, September 13:

- a. Read carefully MF doc ch.6.1.
- b. Optional but highly recommended: Read B/K lecture notes ch.1.2 (Introduction to Functions) but skip ch.1.2.4: Floor and Ceiling Functions

Reading assignment 3 - due Friday, September 15:

- a. Read carefully the remainder of MF doc ch.6.
- b. Read carefully B/G ch.6.1 (Equivalence Relations).

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: (You'll get one point each for **a** and **b**)

Given are four sets A, B, C, D . prove that

- a. $(A \times B) \cap (C \times D) \subseteq (A \cap C) \times (B \cap D)$,
- b. $(A \times B) \cap (C \times D) \supseteq (A \cap C) \times (B \cap D)$.

Written assignment 2: (You'll get one point each for **a** and **b**)

Prove equation (5.8) of MF prop 5.1 (p.92) for the case $a < b$: Let $a, b \in \mathbb{R}$ such that $a < b$. For $n \in \mathbb{N}$ let $A_n := [a + 1/n, b - 1/n]$. Then

- a. $]a, b[\subseteq \bigcup_{n \in \mathbb{N}} A_n$,
- b. $]a, b[\supseteq \bigcup_{n \in \mathbb{N}} A_n$.

(Hint #1) Be sure you read the remarks that precede prop.5.1.

(Hint #2) Read and understand case 3 ($a < b$) of the proof for equation (5.7) of MF prop 5.1 before you attempt to do this homework.

To give an acceptable proof, both **a** and **b** will require you to state at the appropriate place that $\bigcup_{n \in \mathbb{N}} A_n = \{x : x \in A_n \text{ for } \underline{\hspace{2cm}} \text{What goes here?} \}$