

Math 330 Section 1 - Spring 2026 - Homework 04

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Running total: 18 points

Status - Reading Assignments:

The reading assignments you were asked to complete before the first one of this HW are:

MF lecture notes:

ch.1 - ch.3, skim ch.4, ch.5.1 - ch.5.2.4

B/G (Beck/Geoghegan) Textbook:

ch.2.1 - 2.2, ch.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)

Reading assignment 1 - due Monday, February 9:

- a. Read carefully the remainder of MF ch.5.2 (sections 5.2.5 - 5.2.8). Particularly important: the connection between injectivity, surjectivity, and right/left inverses. Some of the material has already been encountered in ch.2., but here we go deeper. Note that Cartesian products being sets containing families as their elements requires getting used to!
- b. The stronger students are encouraged to look at ch.5.3. The material is quite accessible. Only the proof of Proposition 5.13 is tough to digest.

Reading assignment 2 - due: Wednesday, February 11:

- a. Read carefully B/G ch.5 on sets and functions and B/G ch.9.1. You already have encountered the material in MF ch.2 and ch.5.1 - 5.2.
- b. Read **extra carefully** MF ch.6.1. We briefly did induction already: We proved the (finite) geometric series formula. Proofs by induction will appear on all major exams!
- c. Read carefully MF ch.6.2 and 6.3. They are very brief.

Reading assignment 3 - due Friday, February 13:

- a. Read carefully B/G ch.2.3 on induction. Work through the proofs by induction given there.
- b. Carefully read MF ch.6.4 - 6.6.
- c. You are encouraged to look at the optional chapter 6.7 on Bernstein Polynomials. The proofs are very good examples of proofs by induction.

Written assignments are on the next page.

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: Use anything before Proposition 3.55 to prove the following part of Proposition 3.55:

Let (R, \oplus, \odot, P) be an ordered integral domain. Let $A \subseteq R$. If A has a minimum then it also has an infimum, and $\min(A) = \inf(A)$. Surprisingly tough! Start early!

Written assignment 2: Use the rules of working with quantifiers to negate the following statement (see B/G ch.3.3). No need at all to understand the meaning of this statement. ¹

$\forall \alpha > 0 \exists \beta > 0$ such that $\forall x \in N_\beta(z)$ it is true that $f(x) \in N_\alpha(f(z))$.

¹You will learn later in this course that this is the definition of continuity of a function $x \mapsto f(x)$ at a point z in the domain of f .