

Math 330 Section 7 - Fall 2026 - Homework 06

Published: Tuesday, September 8, 2026
Last submission: Friday, October 2, 2026

Running total: 28 points

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by this date.

MF lecture notes:

ch.1 – 6.2; skim/skip ch.4 on logic

B/G (Beck/Geoghegan) Textbook:

ch.2.1 – 2.2, ch.3, ch.5, ch.9.1

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, September 14:

- 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.

Reading assignment 2 - due: Wednesday, September 16:

- a. Read carefully MF ch.6.8 - 6.10.
- b. Read carefully B/G ch.2.4 and ch.4.1 - 4.3. You already have encountered the material in MF ch.6. (Except for the chapter on logic, but that was addressed in lecture.)

Reading assignment 3 - due Friday, September 18:

- a. Read carefully the remainder of B/G ch.4 - 5 and B/G ch.9.2. You already have encountered the material in MF ch.5 and ch.6. Work through the proofs by induction given in B/G ch.4.
- b. Read carefully MF ch.6.11.

Written assignments are on the next page.

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:

Let $X, Y \neq \emptyset$ and $f : X \rightarrow Y$.

(a) Prove that $R := \{(x, x') \in X \times X : f(x) = f(x')\}$ is an equivalence relation on X . Write xRx' rather than $(x, x') \in R$!

(b) For the special case $f : \mathbb{R} \rightarrow \mathbb{R}; x \rightarrow x^2$ compute the equivalence classes $[2], [0], [-2]$ for this equivalence relation.

One point each for (a) and (b)!!

Written assignment 2:

Prove formulas (5.15) and (5.16) of Proposition 5.3: Let $f : X \rightarrow Y$. Then

(a) (5.15) $A_1 \subseteq A_2 \subseteq X \Rightarrow f(A_1) \subseteq f(A_2)$

(b) (5.16) $B_1 \subseteq B_2 \subseteq Y \Rightarrow f^{-1}(B_1) \subseteq f^{-1}(B_2)$

One point each for (a) and (b)!!

Hint: Start (a) as follows: Let $y \in f(A_1)$ Start (b) as follows: Let $x \in f^{-1}(B_1)$