Math 330 Section 1 - Spring 2026 - Homework 06

Published: Tuesday, February 3, 2026   Running total: 28 points
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Status - Reading Assignments:

The reading assignments you were asked to complete before the first one of this HW are unchanged from HW5.

MF lecture notes:
      ch.1 - ch.3, skim ch.4, ch.5.1 - ch.6.7

B/G (Beck/Geoghegan) Textbook:
      ch.2.1 – 2.3, 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)

New reading assignments:

Reading assignment 1 - due Monday, February 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 2 - due: Wednesday, February 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.

Reading assignment 3 - due Friday, February 20:
   •   Study for the midterm! Proofs by induction will be disproportionately important! Look at B/G ch.2.3 and MF ch.21 (Exam Preparation)

> **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 assignments are on the next page.

Written assignment 1:

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

(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 $f : \mathbb{R} \to \mathbb{R}; \quad x \to x^2$ 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 $f : X \to Y$. 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 $x \in f^{-1}(B_1)$. .....