Math 330 Section 2 - Spring 2017 - Homework 06

Published: Thursday, September 7, 2017 *Running total:* 28 *points*
Last submission: Wednesday, September 20, 2017 ***NO RESUBMISSIONS***

This homework is published concurrently with homework 5. It is worth a total of 6 *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.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: None: They came with homework 5.

Written assignment 1:

Injectivity and Surjectivity

- Let $f : \mathbb{R} \longrightarrow [0, \infty[; \quad x \mapsto x^2$.
- Let $g : [0, \infty[\longrightarrow [0, \infty[; \quad x \mapsto x^2$.
  In other words, g is same function as f as far as assigning function values is concerned, but its domain was downsized to $[0, \infty[$.

Answer the following with **true** or **false**.

a. f is surjective **c.** g is surjective
b. f is injective **d.** g is injective

If your answer is **false** then give a specific counterexample.

Written assignment 2:

Find $f : X \longrightarrow Y$ and $A \subseteq X$ such that $f(A^{\complement}) \neq f(A)^{\complement}$. Hint: use $f(x) = x^2$ and choose Y as a **one element only** set (which does not leave you a whole lot of choices for X). See example 4.17 on p.76.

Written assignment 3:

You will learn later in this course that
injective $\circ$ injective $=$ injective,
surjective $\circ$ surjective $=$ surjective.

The following illustrates that the reverse is not necessarily true.

Find functions $f : \{a\} \longrightarrow \{b_1, b_2\}$ and $g : \{b_1, b_2\} \longrightarrow \{a\}$ such that $h := g \circ f : \{a\}$ is bijective but such that it is **not true** that both f, g are injective and it is also **not true** that both f, g are surjective.

Hint: There are not a whole lot of possibilities. Draw possible candidates for f and g in arrow notation as on p.118. You should easily be able to figure out some examples. Again, think simple and look at example 4.17 on p.76.