Math 330 Section 2 - Spring 2017 - Homework 05

Published: Friday, February 3, 2017 Running total: 24 points
Last submission: Wednesday, February 15, 2017 **NO RESUBMISSIONS**

This homework is published concurrently with homework 6. 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 (identical to what you see in hwk 6).

B/G (Beck/Geoghegan) Textbook:
all of ch.1 - ch.3, ch.5 and ch.4.1-4.4.

MF lecture notes:
a. *ch.1 - ch.2, ch.4 - ch.6*
b. *Read carefully MF ch.16.1 (addenda to B/G ch.1) and ch.16.4 (addenda to B/G ch.4).*

B/K lecture notes (optional reading – good for examples, improved understanding):
ch.1 – section 1, ch.4.1, ch.4.2

New reading assignments: *None: They will come with homework 6.*

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.81.*

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.81.