

Math 330 Section 5 - Spring 2018 - Homework 06

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Running total: 29 points

Last submission: Friday, February 14, 2018 **NO RESUBMISSIONS**

New reading assignments: None: They came with homework 5.

The written assignments are graded only once, and partial credit is given. The entire set is worth 6 points.

Written assignment 1:

Injectivity and Surjectivity

- Let $f : \mathbb{R} \rightarrow [0, \infty[; x \mapsto x^2$.
- Let $g : [0, \infty[\rightarrow [0, \infty[; x \mapsto x^2$.

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 $f : X \rightarrow Y$ and $A \subseteq X$ such that $f(A^c) \neq f(A)^c$. 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 MF example 5.17 on approx. p.90.

Written assignment 3:

Let $f :] - 10, 10[\rightarrow \mathbb{R}; x \mapsto x^2$.

- a. what is the range of f ? b. Is f injective? c. Is f surjective?
- d. $f(\{1\} \cup [4, 6]) = ?$ e. $f([2, 5]) \cap f([4, 7]) = ?$ f. $f^{-1}([4, 25]) \cap f^{-1}([16, 49]) = ?$

Written assignment 4:

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 $f : \{a\} \rightarrow \{b_1, b_2\}$ and $g : \{b_1, b_2\} \rightarrow \{a\}$ 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 MF example 5.17 on approx. p.90.