Circle: DGD 1 (Frédéric) LAST NAME (in capitals):
DGD 2 (Yue) First name:
DGD 3 (Andrew)

Marks: /14 Student number:

**MAT 1348A (Prof. T. Schmah) — Sixth Homework Assignment**
**Due Thursday Mar. 10, 2016 by 11:00am (NOTE new day and time)**

**Instructions:**

Print out this document and staple the pages. You may write on both sides of the paper or insert additional pages if necessary.

Submit a finished, presentable product. *Drafts and illegible papers will not be marked.* Show all relevant work to receive full credit.

Submit the assignment to your TA in the DGD or in the *submission box labeled MAT 1348A* in the Department of Mathematics and Statistics.

Circle the DGD you attend. Your marked paper will be returned to you in that DGD.

Late assignments will not be accepted.

**Important note on academic integrity:**

Students are permitted, and indeed encouraged, to discuss homework problems with others, but are not permitted to help each other write the final solutions (unless the assignment is explicitly announced as a group assignment). Once you understand a solution, you must write it out entirely by yourself. For each question, any help from other people must be clearly acknowledged, as well as any sources used (e.g. textbooks, websites, videos), if that source contains a solution to a very similar question, or a new method or idea that you used that was not in the course materials. Failure to follow these rules constitutes plagiarism (academic fraud). Note that if one student copies from the other, both students have committed academic fraud. If we believe plagiarism has occurred, the students will receive:

- a mark of 0 for the current assignment if this is the first offence;
- a mark of 0 for the whole assignment component of the course if this is the second offence.

Students are advised to carefully examine the *University Guidelines on Academic Integrity* — see

`http://web5.uottawa.ca/mcs-smc/academicintegrity/home.php`

as well as the *Course Policy on Plagiarism* — see

`http://mysite.science.uottawa.ca/msajna//teaching/plagiarism_policy.html`

**Please sign below to confirm that you have read and understood these regulations and policies, and you agree to act with academic integrity as defined therein.**

**Student's signature:**

1. Let $A$, $B$, and $C$ be sets, and $f : A \to B$ and $g : B \to C$ two functions. Prove the statement or give a counterexample. [4pts]

   (a) If $g \circ f$ is injective, then $f$ is injective.

   (b) If $g$ is surjective, then $g \circ f$ is surjective.

2. (a) Is the function $f : \mathbb{Z}^2 \to \mathbb{Z}^2$ defined by $f(x, y) = (x - y, -x)$ invertible? If so, determine its inverse.

   (b) Is the function $g : \mathbb{Z} \to \mathbb{N}$ defined by $g(n) = (n - 1)^2$ invertible? If so, determine its inverse. [6pts]

   *Fully justify your answers.*

3. Let $A = \{1, 2, 3, 4\}$ . Give an example of a non-empty binary relation on the set $A$ that is:

   (a) reflexive and symmetric, but not antisymmetric;

   (b) symmetric and antisymmetric, but not reflexive;

   (c) transitive but neither symmetric nor antisymmetric;

   (d) antisymmetric but not transitive.

[4pts]