Circle: DGD 1 (Frédéric)
DGD 2 (Yue)
DGD 3 (Andrew)

Marks: /11

MAT 1348A (Prof. T. Schmah) — Seventh Homework Assignment
Due Thursday Mar. 17, 2016 by 11:00am

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.

Additional instructions:

This is a **group assignment**. Form a team of **up to 3 members**, and submit one paper for the team. All members of the team will receive the same mark.

Each member is **fully responsible** for the assignment and may be asked to reproduce part of it on short notice. If any member is unable to satisfactorily explain the assignment, the whole assignment may receive a mark of 0.

Each member must write his/her name below and sign to confirm that they have read and understood the above instructions.

Team Members:

1. LAST NAME (in capitals): ____________ First Name: ____________

   Student number: ____________ Signature: ____________

2. LAST NAME (in capitals): ____________ First Name: ____________

   Student number: ____________ Signature: ____________

3. LAST NAME (in capitals): ____________ First Name: ____________

   Student number: ____________ Signature: ____________

1. A binary relation $\mathcal{R}$ is defined on the set $\mathbb{Z}^2$ as follows: [7pts]

$$(a, b)\mathcal{R}(c, d) \quad \leftrightarrow \quad a \equiv c \pmod 2 \text{ and } b \equiv d \pmod 3.$$

(a) Prove that $\mathcal{R}$ is an equivalence relation on $\mathbb{Z}^2$.

(b) Determine the equivalence class of $(1, 2)$ with respect to $\mathcal{R}$. *Describe it as precisely as possible.*

(c) How many distinct equivalence classes with respect to $\mathcal{R}$ are there in total? *Briefly justify your answer.*

2. Let $A = \{a_1, a_2, a_3, a_4\}$ and $B = \{b_1, b_2, b_3, b_4, b_5\}$ (so that $|A| = 4$ and $|B| = 5$). How many injective functions $f : A \to B$ satisfy $f(a_1) = b_1$ **or** $f(a_2) = b_2$? *(This is an inclusive or.)* [4pts]