# MTH 3110: Abstract Algebra I
# Fall Semester 2018
# Problem List 2

Prof: Mandi Schaeffer Fry

Due 9/14/18

You are encouraged to ask questions during office hours. You are also encouraged to work through problems together and bounce ideas off of one another; however, the actual write up should be done on your own. This means your homework should not be identical to another person's.

NOTE: Late homework will NOT be accepted without the use of a "full redo". Solutions should be submitted at **to my office or email by 9/14/18 at 3pm** (or in class on Wednesday 9/12) in clear writing, written neatly, using complete sentences. (This may require re-writing your final draft to turn in!) Multiple pages should be stapled. (I will NOT provide the stapler.) Points will be deducted from assignments not following these guidelines. Recall that if you use LaTeX (including Overleaf) to typeset your homework, you'll get an extra "full redo".

## 1 Before Class On...

- Wed, 9/5: Read Chapters 0-2
- Wed, 9/12: Read Chapter 3

## 2 Notation and Definitions to Know

An $*$ denotes Flashquiz - eligible items.

- *group
- *abelian group
- *inverse element
- *identity element
- order (of a group or of an element)
- understand $\mathbb{Z}_n$, $U(n)$, and their natural operations

## 3 For Practice...

All exercises listed as practice problems are from Gallian **6th** edition - compare with me or a classmate to make sure you have the right ones.

- Chapter 1, exercises 1-4
- Chapter 2, exercises 6, 7, 15-18, 23-26, 34

## 4 To Turn In on 9/14/18 by 3pm

1. Form the Cayley table for the set $\{5, 15, 25, 35\}$ under multiplication modulo 40. Use this to explain why the set forms a group. (Make sure you identify the identity and inverses.) Can you see any relationship between this group and $U(8)$?

2. Let $G$ be a group, and let $a, b \in G$. Show that $(ab)^{-1} = b^{-1}a^{-1}$. Why do you think this is sometimes called the "Socks-Shoes" property?

3. Let $G$ be a group with identity $e$.

   (a) Show that if $(ab)^2 = a^2b^2$ for all $a, b \in G$, then $G$ is abelian.

   (b) Show that if $g^2 = e$ for all $g \in G$, then $G$ is abelian.