

MAD 5196, Fall 21

Homework 1

Instructions: Write solutions to the problems below.

Submitting: You will upload your solutions on the Canvas page. To do so, you need to turn your solutions into an image file, using one of the following options:

- Typeset your solutions and produce a pdf. If you would like help getting started with typesetting mathematics in \LaTeX (the language that was used to produce this document, and most other documents in math and statistics), please let me know!
- Write your solutions using a tablet and export to a pdf.
- Write your solutions on paper and take a photo using an app such as CamScanner.

If you are hand writing your solutions, it is expected that you turn in a legible, well organized final draft. Your solutions should be uploaded to Canvas by **11:59pm on 9/10/21**. A random subset of the problems will be graded in detail.

Collaboration and Other Resources: You are encouraged to collaborate on homework with your classmates, but you need to write up your own solutions in your own words. Solutions or hints for solutions to some of these problems can probably be found in other textbooks or on the internet; if you consult an outside resource, you are **required** to cite the exact resource that you used and your solution must still be written in your own words. Remember, the point of working on these problems is to improve your understanding of the material; copying solutions from classmates or another resource completely misses the point and will moreover be considered a violation of the Academic Honesty policy! Please don't hesitate to discuss homework problems with me in office hours.

1 Problems

The problems below are from our textbook. I've included some remarks/clarifications/hints.

1. Problem 2.1. The notation $\mathbb{R} \setminus \{-1\}$ means “all real numbers except -1”. To show that $(\mathbb{R} \setminus \{-1\}, \star)$ is Abelian group, you need to verify that the algebraic structure defined by \star satisfies the required properties of an Abelian group.
2. Problem 2.4.
3. Problem 2.5. The term *inhomogeneous* means that the systems of equations are of the form $A\vec{x} = \vec{b}$, where \vec{b} is not the zero vector. Give your answers in set notation, as we did in class.
4. Problem 2.6. The term *Gaussian elimination* just means putting the augmented matrix into reduced row echelon form via elementary transformations.
5. Problem 2.7.
6. Problem 2.9. Each part has a Yes/No answer, but please also give a short explanation of your reasoning.

7. Problem 2.10. Show some work here.

Note: The following problems may be deferred to Homework 2, depending on how far we get in Week 2 of the course. I will let you know if this is the case by 9/2.

8. Problem 2.11.

9. Problem 2.12.

10. Problem 2.13.

11. Problem 2.14.