

MAT 150A, Fall 2023
Homework 5

Due before 12:10 on Wednesday, November 8

Please write the homework solutions in connected sentences and explain your work. Mark the answers to each question. Scan or take pictures of your homework and upload it to Gradescope before due time.

The first three problems are focused on the set U of matrices of the form $\begin{pmatrix} 1 & x \\ 0 & 1 \end{pmatrix}$ where x is an arbitrary real number.

1. Prove that U is a subgroup of $GL(2)$.
2. Prove that the group U is isomorphic to $(\mathbb{R}, +)$.
3. Is U a **normal** subgroup of $GL(2)$? Please explain your answer in detail.
4. Use Chinese Remainder Theorem to solve the system of equations

$$x = 3 \pmod{5}, x = 4 \pmod{11}.$$