For this homework, the rules are as follows:

- For questions from Chapter 1, you **do not** need to write down justifications involving Axioms 1.1-1.4. But you must write your steps so that only one thing is being used at a time.
- For questions from Chapter 2, you may write your arguments using familiar rules of arithmetic **so long as** you know how you would convert your argument into a formal one using the techniques of Chapter 1. If in doubt, write out the argument, and I can let you know if the argument is correct.

**Proposition 1.22:**

(i) For all $m \in \mathbb{Z}$, $-(-m) = m$.

*Proof.* Your proof goes here. □

**Proposition 1.25(iii):** For all $m, n \in \mathbb{Z}$,

$$(-m) \cdot n = m \cdot (-n) = -(m \cdot n).$$

*Proof.* Your proof goes here. □

For full credit on this one, you should base your proof on Proposition 1.25(ii).

**Proposition 1.27(v):** For all $m, n, p \in \mathbb{Z}$

$$(m - n) \cdot p = mp - np.$$

*Proof.* Your proof goes here. □

**Proposition 2.3:** $1 \in \mathbb{N}$.

*Proof.* Your proof goes here. □

Hint: Use proof by contradiction. The first line of the proof will be:

"Suppose to the contrary that $1 \notin \mathbb{N}$."

Take advantage of Proposition 2.2 and show that this leads to a contradiction.

**Proposition 2.5:** For each $n \in \mathbb{N}$ there exists $m \in \mathbb{N}$ such that $m > n$.

*Proof.* Your proof goes here. □

**Proposition HW 2.1:** Let $m$, $n$, and $p \in \mathbb{Z}$. If $m < n$ and $p > 0$ then

$$mp < np.$$

*Proof* . Your proof goes here. □

**Proposition 2.9:** Let $m \in \mathbb{Z}$. If $m \neq 0$ then $m^2 \in \mathbb{N}$.

*Proof* . Your proof goes here. □