Feel free to work with other students on these problems. However all written work should be your own. Also, be sure to give written credit, on the assignment, for any ideas you get from other people.

All proofs should be as short and clear as possible. If you deviate from the style of proof given in the notes you should only do so consciously and for good reason.

Exercise 3.1. Define a relation R on $\mathbb{N}\times\mathbb{N}$ by

$$\langle a, b\rangle R\langle c, d\rangle \quad \text{iff} \quad a + d = c + b$$

Prove that R is an equivalence relation on $\mathbb{N}\times\mathbb{N}$.

Exercise 3.2. Provide the proof of Theorem 5.10 as asked for in the third set of notes.

Exercise 3.3. Suppose that $A = \{0, 1, 2, 3\}$. Let $\mathrm{Part}(A)$ be the set of partitions of A. How many elements does $\mathrm{Part}(A)$ have? Organize your work in a reasonable way. (Challenge: can you do the same for a set with n elements?)

Exercise 3.4. Suppose B is a set and $A = \mathcal{P}B$. Let R be the relation on A defined by

$$xRy \quad \text{iff} \quad x \subseteq y.$$

Is R a linear order on A? Why or why not?