Strong Induction and the Well-Ordering Principle

Reading

Section 2.2

Practice Problems

2.2 1, 2, 3, 7

Notes

We will very briefly cover the Well-Ordering Principle and what is known as “strong induction”. For now, we just want you to be aware of their existence.

- In normal induction, we:
  - Prove our statement when $n = 1$
  - Prove that if the statement is true when $n = k$, it must also be true when $n = k + 1$
- In **strong induction**:
  - Prove our statement when $n = 1$
  - Prove that if the statement is true for all $n = 1, 2, 3, ..., k$, then it must be true for $k + 1$ also.
- In other words, we assume all previous statements are true, not just the one right before the one we are working on.
- The **Well-Ordering Principle** says the following:

  > Every non-empty subset of the natural numbers must have a smallest element

  We will see examples of this principle as we move along. But every time we say “let’s take the smallest . . . ” we are applying this principle.