

Homework 1

Real Analysis

Due September 5, 2025

1 Exercises

1. Prove Theorem 4.1 from the Set Theory notes.
2. Observe that

$$1 = 1^2$$

$$1 + 3 = 2^2$$

$$1 + 3 + 5 = 3^2$$

Determine a general formula and prove it using mathematical induction.

3. In Theorem 2.3 of the Natural Numbers notes, we proved the Well-Ordering property from the principle of mathematical induction. Now, prove the principle of mathematical induction from the Well-Ordering property. Hint: Use proof by contradiction.
4. Show that the relations used to define the integers and the rational numbers are equivalence relations.