3.3.13 Prove that there is no integer x such that $x^3 - 4x = 7$.

3.3.15 Prove that there do not exist three consecutive natural numbers such that the cube of the largest is equal to the sum of the cubes of the other two.

4.1.9

1. Determine the intersection and union of $[2, 5]$ and $[-1, \infty)$.
2. Determine the intersection and union of $[2, 5]$ and $[3.4, \infty)$.
3. Determine the intersection and union of $[2, 5]$ and $[7, \infty)$.

Now let a, b and c be real numbers with $a < b$.

4. Explain why the intersection of $[a, b]$ and $[c, +\infty)$ is either a closed interval, a set with one element, or the empty set.
5. Explain why the union of $[a, b]$ and $[c, +\infty)$ is either a closed ray or the union of a closed interval and a closed ray.

4.2.12 Prove the following proposition:

For all sets A, B and C that are subsets of some universal set, if $A \cap B = A \cap C$ and $A^c \cap B = A^c \cap C$, then $B = C$

4.2.8 Let A and B be subsets of some universal set U

1. Prove that A and $B - A$ are disjoint sets
2. Prove that $A \cup B = A \cup (B - A)$.