MTHT 430 Analysis for Teachers

Do Chapter 12: 1 i),ii),iii),viii)

2) Suppose $f : \mathbb{R} \to \mathbb{R}$ is increasing and onto. Prove that f^{-1} is increasing. (See Chapter 12 problem 3)

3) Suppose $g : X \to Y$ and $f : Y \to Z$ are one-to-one and onto. Find an expression for $(f \circ g)^{-1}$ in terms of f^{-1} and g^{-1}. (See Chapter 12 problem 5)

4) Decide if the following sets are bounded above, bounded below, neither or both and find the sup and inf if they exist. [1]

    a) $\{1/n : n \in \mathbb{N}\}$
    b) $\{n/(n+m) : n, m \in \mathbb{N}\}$
    c) $\{x : x^2 + x + 1 \geq 0\}$.
    d) $\{x^2 + x + 1 : x \in \mathbb{R}\}$.

5) a) Suppose $A, B \subset \mathbb{R}$ are nonempty and $a < b$ for all $a \in A$ and $b \in B$. Prove that $\sup A \leq \inf B$.
    b) Give an example of A, B as in a) with $\sup A < \inf B$.
    c) Give an example of A, B as in a) with $\sup A = \inf B$.

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[1]Recall
$$\mathbb{N} = \{1, 2, 3, \ldots\}$$
$$\mathbb{Z} = \{\ldots, -2, -1, 0, 1, 2, \ldots\}.$$