Some of these problems you will already have seen, but they are examples of test questions.

1. If $A$ and $B$ are non-empty subsets of $\mathbb{R}$ that are bounded above, and write
$$A + B = \{a + b : a \in A, b \in B\}.$$ 
Prove that $A + B$ is bounded above and $\sup(A + B) = \sup(A) + \sup(B)$.

2. Find the infimum and supremum of
   (a) $E = \{x \in \mathbb{R} : x^2 - 3x - 5 = 0\}$.
   (b) $E = \{x \in \mathbb{R} : x^2 - 3x - 5 > 0\}$.

3. Given two subsets $A$ and $B$ of $\mathbb{R}$. Assume that $\sup(A) < \inf(B)$. Show that for each $a \in A$ and $b \in B$ we have $a < b$.

4. (a) Prove that if $E$ is uncountable and $F$ is countable, then $E \setminus F := E \cap F^c$ is uncountable.
   (b) Show that the set $S = \{m + n : m, n \in \mathbb{N}\}$ is countable.

5. In a metric space a set is closed if and only if its complement is open.

6. In a metric space every neighborhood is an open set.

7. Show that the set of all limit points of a set $E$ in a metric space $(X, d)$ is a closed set. (Of course, this is part of 43/6.)

8. 44/10.

9. 45/22