1. Making Symbolic Form Explicit

Problem 2.22. Can you think of an argument showing that

Problem 2.23. Give structure trees of the following formulas:

(1) $\forall x\Big(A(x) \implies \big(B(x) \implies C(x)\big)\Big)$
(2) $\exists x\big(A(x) \wedge B(x)\big)$
(3) $\exists x A(x) \wedge \exists x B(x)$

Problem 2.26. The following were rewritten to have restricted quantifiers.

(1) $\exists x, y \in \mathbb{Q} \mid x < y$
(2) $\forall x \in \mathbb{R}\,(\exists y \in \mathbb{R} \mid x < y)$
(3) $\forall x \in \mathbb{Z}\,(\exists m, n \in \mathbb{N} \mid x = m - n)$

Problem 2.27. Write as formulas without restricted quantifiers:

Problem 2.31. Translate into formulas, taking care to express the intended meaning:

(1) The equation $x^2 + 1 = 0$ has a solution.
    $\exists x \in \mathbb{C} \mid x = \pm\sqrt{-1}$
(2) A largest natural number does not exist.
(3) The number 13 is prime.
(4) The number n is prime.
(5) There are infinitely many primes.