# MATH 355: PRACTICE PROBLEMS

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## 1 The Real Numbers

### 1.2 Some Preliminaries.

### 1.3 The Axiom of Completeness.

### 1.4 Consequences of Completeness.

### 1.5 Cardinality.

### 1.6 Cantor's Theorem.

## 2 Sequences and Series

### 2.2 The Limit of a Sequence.

### 2.3 The Algebraic and Order Limit Theorems.

**Exercise** (1).
(a) Let $\epsilon > 0$ be given. Since $(x_n) \to 0$, $\exists N \in \mathbb{N}$ such that for all $n \geq N$, we have $x_n = |x_n| = |x_n - 0| < \epsilon^2$. Hence, $\sqrt{x_n} < \epsilon$. Therefore, for all $n \geq N$, we have $\left|\sqrt{x_n} - 0\right| = \sqrt{x_n} < \epsilon$. Thus, $(\sqrt{x_n}) \to 0$.
(b) Let $\epsilon > 0$ be given.

**Exercise** (2).

**Exercise** (3).

**Exercise** (4).

**Exercise** (7).

**Exercise** (9).

**Exercise** (10).

**Exercise** (12).

### 2.4 The Monotone Convergence Theorem and a First Look at Infinite Series.

**Exercise** (1).

**Exercise** (3).

**Exercise** (8).