18.100C Lecture 1 Summary

Sets. Ordered sets. Examples. Ordering pairs of numbers. Largest element (maximum) and smallest element (minimum) of a subset of an ordered set.

Fact 1.1. *Every nonempty subset of $\mathbb{N}$ has a least element.*

Finite sets. Countable sets.

Theorem 1.2. *Any subset of $\mathbb{N}$ is either finite or countable.*

Hence, any subset of a countable set is finite or countable.

Theorem 1.3. *If S_1 and S_2 are countable, $S_1 \cup S_2$ is countable.*

Hence, $\mathbb{Z}$ is countable.

Theorem 1.4. $\mathbb{N}^2$ *is countable.*

Corollary 1.5. *If S_1 and S_2 are countable, $S_1 \times S_2$ is countable.*

Corollary 1.6. *If $S_1, S_2, \ldots$ are countable sets, $\bigcup_{k=1}^{\infty} S_k$ is countable.*

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18.100C Real Analysis
Fall 2012

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