M1C03 Lecture 17

Sets

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Announcement(s)

1. Test 1 Friday evening.
2. Test 1 details are on Avenue.
3. No quiz this week.

Overview

Reference: Lakins, 4.1 and 4.2.

Sets and set membership

Examples of sets:

- $A = \{1, 2, 3\}$
- $\mathbb{Z} = \{\ldots, -2, -1, 0, 1, 2, \ldots\}$
- $\mathbb{Z}^+ = \{1, 2, 3, \ldots\}$
- $\mathbb{R}$
- $\emptyset = \{\}$
- $B = \{A, \mathbb{Z}, \mathbb{R}, 1\}$

Set membership:

- $1 \in A$
- $4 \in A$
- $\pi \in \mathbb{Z}$
- $\pi \in \mathbb{R}$
- $1 \in \emptyset$
- $\mathbb{Z}^+ \in B$

Set-builder notation

Sets defined with conditions:

- $E = \{n \in \mathbb{Z} \mid \exists k \in \mathbb{Z} \text{ such that } n = 2k\}$
- $\mathbb{Q} = \{x \in \mathbb{R} \mid \exists p, q \in \mathbb{Z},\ q \neq 0 \text{ such that } x = \frac{p}{q}\}$

Set containment

- $A = \{1, 2, 3, 4\}$
- $B = \{1, 2, 3\}$
- $C = \{1, 3, 4\}$
- $D = \{0, 1, 2\}$

Definition: Let X and Y be sets. We say X is a *subset* of Y if for all x, if $x \in X$, then $x \in Y$.

Set containment:

1. $B \subseteq A$
2. $A \subseteq B$
3. $C \subseteq A$
4. $D \subseteq A$
5. $\mathbb{Z} \subseteq \mathbb{Q}$, $\mathbb{Q} \subseteq \mathbb{R}$.
6. $1 \subseteq A$
7. $\emptyset \subseteq A$
8. $A \subseteq A$

Power set

Size of the powerset

S	size of S	size of $\mathcal{P}(S)$