

CSI 30 LECTURE NOTES (Ojakian)

Topic 5: Set Operations

OUTLINE

(References: 2.1, 2.2)

1. Set Operations
 2. Proofs about sets
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1. Set Operations

- (a) From one or more sets, we construct a new set
- (b) For each we have 1) formal description, 2) notation, and 3) Venn diagram picture.

2. Set Product

- (a) Connection to usual multiplication?
- (b) Does $A \times B = B \times A$?
- (c) Count the number of elements.
- (d) Picture it (not Venn): Make a grid.

3. Set Union

- (a) Connection to OR
- (b) Do in Python

4. Set Intersection

- (a) Connection to AND
- (b) Define disjoint.
- (c) Do in Python

5. Set Difference

- (a) Connection to subtraction
- (b) Do in Python

6. Set Complement

- (a) Start with just one set
- (b) Need stated universal set.

7. Power Set

- (a) Start with just one set

8. Putting Them Together

- (a) Exercise: Consider why some of the set identities in Section 2.2.2 (page 136) are true?
- (b) Do some examples in Python of their truth

9. Proofs about sets

- (a) Proof by Venn Diagrams
 - i. Example: Pick a set identity from Table 1 (Section 2.2, page 136)
- (b) Proof by Membership Table
 - i. Example 13 (section 2.2)
- (c) Proof from Definitions or Subset Method (and maybe some set laws)
 - i. Example: Prove that if $A \subseteq B$ and $B \subseteq C$, then $A \subseteq C$.
 - ii. Example 10 (half): Prove that $\overline{A \cap B} \subseteq \overline{A} \cup \overline{B}$
 - iii. Example 14. Using laws

10. More exercises

- (a) Python Problems: Write some of the set operations in Python.
- (b) Consider what various Python commands should output?
- (c) Section 2.2: 2 - 17, 19 - 34