Intro to Discrete Structures
Lecture 15

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DeMorgan for Intersection

Example 10: Prove

$$\overline{\bigcap_{j=1}^{n} A_j} = \bigcup_{j=1}^{n} \overline{A_j}$$

whenever $A_1, A_2, \ldots, A_n$ are subset of a universal U and $n \geq 2$.

Basis step $\overline{A_1 \cap A_2} = \overline{A}_1 \cup \overline{A}_2$

DeMorgan for Intersection

Inductive step

$$\overline{\bigcap_{j=1}^{n} A_j} = \bigcup_{j=1}^{n} \overline{A}_j$$

$$\overline{\bigcap_{j=1}^{n+1} A_j} = \overline{\bigcap_{j=1}^{n} A_j \cap A_{n+1}}$$

$$= \overline{\bigcap_{j=1}^{n} A_j} \cup \overline{A}_{n+1}$$

$$= \bigcup_{j=1}^{n} \overline{A}_j \cup \overline{A}_{n+1} = \bigcup_{j=1}^{n+1} \overline{A}_j$$