

Relations

Section 8.1, 8.3—8.5 of Rosen

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CSCE 235 Introduction to Discrete Structures

Course web-page: cse.unl.edu/~cse235

Questions: cse235@cse.unl.edu

Outline

- Relation:
 - Definition, representation, relation on a set
- Properties
 - Reflexivity, symmetry, antisymmetric, irreflexive, asymmetric
- Combining relations
 - \cap , \cup , \setminus , composite of relations
- Representing relations
 - 0-1 matrices, directed graphs
- Closure of relations
 - Reflexive closure, diagonal relation, Warshall's Algorithm,
- Equivalence relations:
 - Equivalence class, partitions,

Introduction

- A relation between elements of two sets is a subset of their Cartesian products (set of all ordered pairs)
- **Definition:** A binary relation from a set A to a set B is a subset $R \subseteq A \times B = \{ (a,b) \mid a \in A, b \in B \}$
- Relation versus function
 - In a relation, each $a \in A$ can map to multiple elements in B
 - Relations are more general than functions
- When $(a,b) \in R$, we say that a is related to b .
- Notation: aRb , ~~aRb~~ aRb , $a \notin R b$