Math 171 – Discrete Mathematical Structures

Today’s Overview

Relations – Definition of
Representing Relations
n-ary relations and Relational Databases

Definition of Relation: Given non-empty sets A and B a relation R is any subset of $A \times B$

Examples:
- $\leq$ on Z (or $\mathbb{Z} \times \mathbb{Z}$)
- $\subseteq \cap \mathcal{P}(S)$ for any non-empty set S
- $\equiv \mod 7$ on Z; i.e. $a \equiv \mod 7 b \iff 7 \mid (a-b)$

Representing Relations
- Sets of ordered pairs
- Tables
- Directed graphs
- Adjacency matrices

Inverse Relations and Functions

Question: When is a relation R on $A \times B$ a function?

Answer: $\forall x \in A \exists y \in B \left( (x, y) \in R \right)$

if $(x_1, y_1) \in R$ and $(x_2, y_2) \in R$ then $x_1 = x_2$

A function $f: A \rightarrow B$ is a rule or mapping that assigns to every $x \in A$ a unique $y \in B$.

Relational Databases: n-ary relations

Relational Algebra
Set Operations: Union, Difference, Intersection
requires union compatibility
Cartesian Product
Projection (selects attributes from a relation)
Selection (selects n-tuples)
Join (product, selection, projection)

Written Homework #24 – Due F 11/01/13

Exercise Set 8.1 (page 448)
- #3, #8, #11, #15, #17, #19