review session:

- Relations
- Partial orders
- Algorithm
- Asymptotics
- Sequence and Summations
- Induction.
- Recurison
- Master Theorem
- Combinatonics:

→ the materials before the Midterm.

Relations.

Section 8.1. 8.3 , 8.4. 8.5.

→ Relation :

Definition , representation. relation on a set.

→ Properties :

Reflexivity, symmetry, antisymmetric, Irreflexive, asymmetric.

→ Combing relations.

$\cup$. $\cap$. $-$. $\circ$

→ Representing relations.

matrices. directed graph.

→ Closure. of relations.

→ Equivalence relation :

Relations:

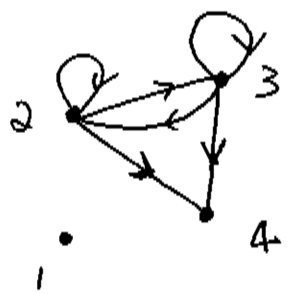
* Consider the relation R_1, R_2 on the set $S = \{1, 2, 3, 4\}$ defined as follows:

$$R_1 = \{(2,2), (2,3), (2,4), (3,2), (3,3), (3,4)\}$$
$$R_2 = \{(1,2), (2,1), (2,2), (3,3)\}$$

a) Draw the 0-1 matrix representation of R_1

$$\begin{array}{c c} & \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} & \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

b) Draw the diagraph representation of R_1



c) Compute the matrix for $R_1 \cup R_2$.

$$\begin{array}{c c} & \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} & \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

d) Is R_1 reflexive?

No, since $(1,1) \notin R$.

e) Is R_1 symmetric?

No, since $(2,4) \in R$. but $(4,2) \notin R$

f) Is R_1 transitive?

Yes. it is transitive.

g) Is R_1 an equivalent relation?

No. Since equivalence relations must be reflexive, symmetric, and transitive, but R_1 is not reflexive nor symmetric.

Partial order

Section 8.6.

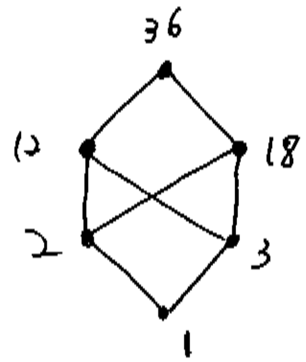
- → Definition
- → Principle of well-ordered induction.
- → Lexicographic orderings
- → Hasse Diagrams
- → Extremal elements.
- → Lattices
- → Topological Sorting.

Partial order :

* Answer these questions from the poset :

({1, 2, 3, 12, 18, 36}, |) i.e. a R b if a divides b

a) Draw the Hasse diagram for this poset:



b) what's the maximal elements in this poset?

{36}

c) what's the minimal elements in this poset?

{1}

d) what's the greatest lower bound of {2, 3}?

{1}

e) what's the upper bound of {2, 3}?

{12, 18, 36}

f) what's the least upper bounds of {2, 3}?

NONE.

e) Is this poset a Lattice?

No, ∵ for {12, 18, 36}, none of them precedes the other two w.r.t. the ordering of this poset.