REVIEW

CH 1

- 1.1 - Set of operations (thm 1.1.22)
- 1.2 - 1.3 - propositions, truth tables, DNF, CNF
- 1.4 - 1.6 - predicates & quantifiers

CH 2

- 2.1 - 2.3 - Basic Proof techniques
- 2.4 - Induction
- 2.5 - Q-R thm.

CH3

3.1 - functions (inj., surj., bij., inverse, $f \circ g$)

3.2 - Sequences, Strings (Σ, Π), recursive sequences

3.3 - 3.4 - Binary Relations (Reflexive, transitive, anti-sym., equivalence relation, equivalence classes, partial / total orders)

3.5 - Matricies (defn. only)

CH 5

5.1, 5.3 - divisors, gcd, lcm, Euclidean algo.

5.2 - Counting bases

CH6

6.1 - Multiplication Principle, Addition Principle, I-E

6.2 - permutation, choose operator

6.7 - Binomial Thm, Pascal triangle

6.8 - Pidgeon Hole Principle

CH 8

8.1 - Graph Basics (Vertices, ~~Edges~~, undirected / directed, paths, cycles, degree

8.2 - Euler cycles / paths,

8.3 - Hamiltonian cycles / paths

8.6 - Graph Isomorphism

CH 7

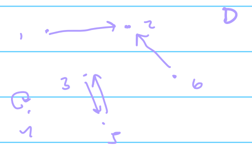
7.2 - solving reccurence relations

a) Algo ($s_n = C_1 S_{n-1}$ $C_2 S_{1-2}$ $S_0 = A_0$ $S_1 = A_1$)

b) repeated Iteration + verify by induction

BINARY RELATIONS

Binary relation R on set D is $R \subseteq D \times D$



$R = \{(1,2), (6,2), (3,3), (3,5), (5,3), (4,4)\}$

Let D, be a set, R, relation on D,

R is reflexive if $\forall x.\ xRx$ ("all loops")

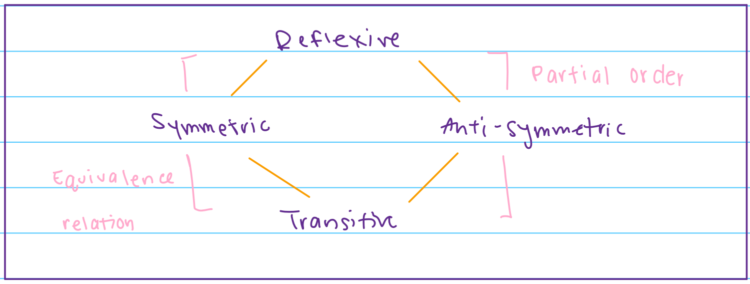
R is Symmetric if $\forall x, y \in D.\ (xRy) \to (yRx)$

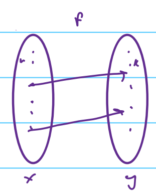
R is Anti-Symmetric $\forall x, y \in D\ [(x \neq y \wedge (xRy)] \to \neg yRx$ ("0 or 1 edges")

R is Transitive $\forall x, y, z \in D.\ [(xRy) \wedge (yRz)] \to (xRz)$

Equivalence Relation – Ref., Sym., Transitive

Partial / Total order – Ref, anti-sym, Transitive





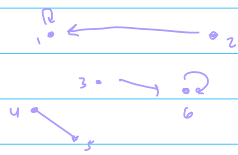
$|x| = n$ $|y| = k$ $n > k$; f – not – injective

GRAPH ISOMORPHISM

Let $G_1 = (V_1, E_1)$, $G_2 = (V_2, E_2)$

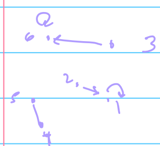
$G_1 \cong G_2$ iff there is a bijection $b: V_1 \to V_2$ s.t.

$(v_i, v_j) \in E_1 \iff (b(v_i), b(v_j)) \in E_2$

G 

Find isomorphism b from G to itself $\forall x.\ b(x) \neq x$

① look for bijection $\{1,2,3,4,5,6\} \to \{1,2,3,4,5,6\}$



s.t. $\forall x.\ b(x) \neq x$ and it is an isomorphism

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 3 & 2 & 5 & 4 & 1 \end{bmatrix}$$

RECURRENCE RELATIONS

Solve $a_n = 6a_{n-1} - 9a_{n-2}$ $a_0 = a_1 = 1$ 1, 1, −3, −27, −135, ...

① Solve: $t^2 - 6t + 9 = 0$ $r_1 = r_2 = 3$

$(t-3)^2 = 0$

② General Solution: $a_n = B3^n + Dn3^n$

③ $n=0$

$a_0 = B3^0 + D(0)(3^0) = B = 1$

$n=1$

$a_1 = B\cdot 3 + D\cdot 1\cdot 3 = 3B + 3D = 1$

$D = -2/3$

Solution: $a_n = 3^n - \frac{2}{3}n\cdot 3^n = \boxed{3^n - 2n3^{n-1}}$

$a_0 = 1 - 0 = 1$

$a_1 = 3 - 2(3^0) = 1$

$a_2 = 3^2 - 2\cdot 2\cdot 3 = 9 - 12 = -3$

$a_3 = 3^3 - 2\cdot 3\cdot 3^2 = 27 - 6\cdot 9 = -27$

$a_4 = 3^4 - 2\cdot 4\cdot 3^3 = 81 - 8\cdot 27 = -135$

matches sequence ✓