1) M, 3층 P.8 (木) 이산수학 복습 II

ref., symm., tran. closure of $R \subseteq A \times A$ R'

i) R' is r, s, t.

ii) $R \subseteq R'$ (원본 R은 보존되어야 한다)

iii) smallest R' ∋. i) & ii satisfies.
$\subseteq$

ref. closure of R, $R_r^{\varphi} = R \cup id_A \triangleq R^0$

sym. " of R, $R_s = R \cup R^{-1}$

trans. " " ", $R^{\dagger} = R \cup R^2 \cup R^3 \cup \dots = \bigcup_{i \in \mathbb{N}_1} R^i$

dagger

무한 (But 유한), 단 $\mathbb{N}_1 = \{1, 2, \dots\}$

star

ref & tran. " " " $R^{*} = R^0 \cup R \cup R^2 \cup \dots = \bigcup_{i \in \mathbb{N}_0} R^i$ 단 $\mathbb{N}_0 = \{0, 1, 2, \dots\}$

Partition of A $\Leftrightarrow$ Equivalence relation $R \subseteq A \times A$

└ ref, symm. tran.

예) $= \subseteq \mathbb{N} \times \mathbb{N}$ 로미오와 줄리엣

→ DFA (Deterministic Finite (State) Automata)

partition

$P(A) = \underline{2}^A$ Power set of A

$\triangleq \{B \mid B \subseteq A\}$

function (함수) f : from $\underline{\text{set } A}$ to $\underline{\text{set } B}$

domain (정의역) codomain, range 치역

1. 함수는 관계이다 $f \subseteq A \times B$, $(a, b) \in f$, afb, $f(a) = \cancel{\{} b \cancel{\}}$
rel. R

2. total $\forall_{a \in A}: |f(a)| = 1$ vs $0 \leq |R(a)| \leq |A|$

3. unique

2/ 學而之 名銘 — 孔子의 논어中 학이편의 패러디

학 이 지 명 명

공부한다는 것은 이름 짓는 일이다

名可名, 非常名 — 老子의 도덕경 道可道, 非常道

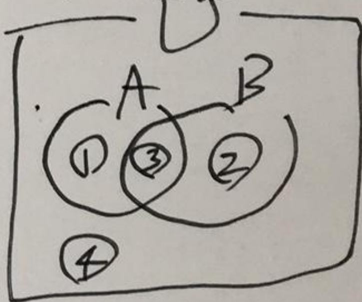
명 가 명 비 상 명

Equivalence Relation $R \subseteq A \times A \Leftrightarrow$ Partition of A ($\hat{R}$, A_i)

$a \in A$ $[a]_R = \{b \in A \mid aRb\}$

If $aRb \to [a]_R = [b]_R$

" $a \not R b \to [a]_R \cap [b]_R = \emptyset$.



2^2 areas

A B	T T
A $\overline{B}$	T F
$\overline{A}$ B	F T
$\overline{A}$ $\overline{B}$	F F

Venn diagram — set

Truth table Logic

1. algebraic system — closed Ex) $(N, +)$
   $(A, \oplus)$
2. semi-group $(A, \oplus)$ — $\oplus$ is associative

   Ex $(N, +)$ $a+(b+c) = (a+b)+c$

   binary op. $\to$ n-ary op.

$$\sum_{i=1}^{100} i = \sum_{i \in \{1,2,\ldots,100\}} i$$

N_1^{100} — indexed set

3. Ex) $(\Sigma^*, \cdot)$ — set of symbols

$\cdot : \Sigma^* \times \Sigma^* \to \Sigma^*$

concatenation

string of length n over Σ

$\{1, 2, \cdots, n\} \to \Sigma$

$\Leftrightarrow \Sigma^n$

$$\Sigma^* = \Sigma^0 \cup \Sigma^1 \cup \Sigma^2 \cup \Sigma^3 \cup \cdots$$

3 Monoid $(A, \oplus, e)$ identity $e \in A$ $\forall a \in A : a \oplus e = e \oplus a = a$

Ex) $(N_0, +, 0)$ $(N_1, \times, 1)$