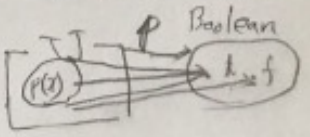
3/7(화) Relation, function, (cardinality of sets)

$R \subseteq A \times A$, $G = (A, R)$ graph.

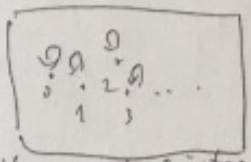
$P = \{x \in U \mid p(x)\}$ predicate $p(x)$ (술어, 서술어)

universe of discourse

$p : U \to \{t, f\}$



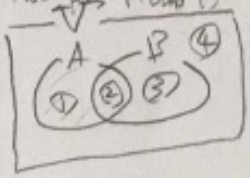
$(\mathbb{N}, =)$



Let $\mathbb{N}$ be a set of integers (natural number)

$= = \{(i, i) \mid i \in \mathbb{N}\}$

Two sets A and B



① $A \cap \bar{B}$

② $A \cap B$

③ $\bar{A} \cap B$

④ $\bar{A} \cap \bar{B}$

$$\begin{cases} R^0 = {}_{\text{def}} id_A \\ R^n = {}_{\text{def}} R \cdot R^{n-1} \end{cases} \quad n \geq 1 \qquad \text{vs} \qquad \begin{cases} R^1 = R \\ R^n = R \cdot R^{n-1} \end{cases} \quad n \geq 2$$

$n \geq 0$ $\qquad$ $n \geq 1$

transitive closure of a relation R on A. $(R \subseteq A \times A)$

Lemma 1.3

R^+ transitive

$R \subseteq R^+$

2 smallest among (1)

$$R^+ = \cancel{\bigcup_{i=1}^{\infty} R^i} = \bigcup_{i \in \mathbb{N}_1} R^i \quad \text{where } \mathbb{N}_1 = \{1, 2, 3, \dots\}$$

ref. tr-

$$R^* = \cancel{\bigcup_{i=0}^{\infty} R^i} = \bigcup_{i \in \mathbb{N}_0} R^i \quad \text{where } \mathbb{N}_0 = \{0, 1, 2, \dots\}$$

3 $R \subseteq R^*$

index of set