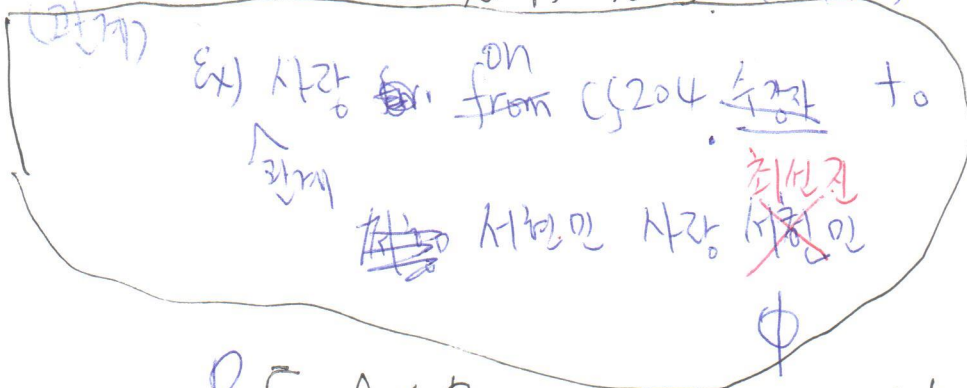


# 3/9 (4) Discrete math 3

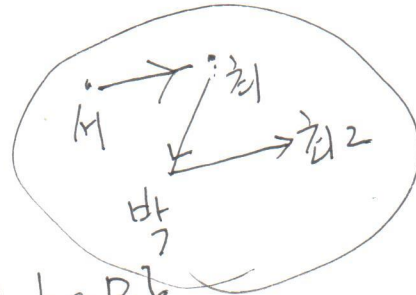
Preview Relation:  $R$  from the set  $A$  to  $B$  (on  $A$ )



$$R \subseteq A \times B$$

Domain (set) Codomain (set)

graphical notation



Def1. Cartesian Product of two sets  $A$  &  $B$ .

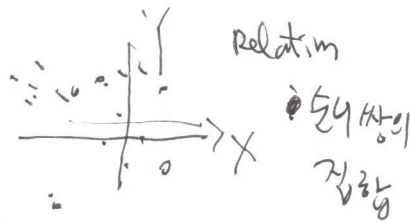
Def2. Relation from  $A$  to  $B$ .

$$A \times B \stackrel{\text{def}}{=} \{ (a, b) \in (A \times B) \mid a \in A, b \in B \}$$

$$|A \times B| = |A| \times |B|$$

an ordered pair

순서쌍 (X x Y) 고등. 2차원 공간



①  $(a, b) \in R$   $R \subseteq A \times B$  집합 포함 관계  $(a, b) \notin R$

②  $a R b$  if  $(a, b) \in R$  ...  $R$ : infix binary  $a \not R b$

$$R: A \times B \rightarrow \{T, F\} \text{ 관계 (진리)}$$

③  $R(a) = \{b\}$   $R: A \rightarrow 2^B$

\* Power set ( 멱집합 )

$$P(A) = 2^A$$

$$\stackrel{\text{def}}{=} \{ B \subseteq A \}$$

$$|2^A| = 2^{|A|}$$

고급 (2^A)

Def3 function from the domain (set)  $A$  to the range (set)  $B$   
 $f: A \rightarrow B$  relation, total, uniqueness

①  $\forall a \in A; \exists! (a, b) \in f$

②  $\forall a \in A; \exists! b \in B \mid a f b = T$

③  $f(a) = b$  (중요교과서 쓰기, uniqueness 를 가정)

Relation  $R$  on  $A$

1. reflexive  $\forall a \in A, aRa$

2. symmetric  $\forall a, b \in A, aRb \Rightarrow bRa$

3. transitive  $\forall a, b, c \in A (aRb \wedge bRc) \Rightarrow aRc$

Partim on  $A$

$$P(A) = \{ [a]_R \mid a \in A \}$$

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

(equivalence class)

Ex)  $\subseteq N \times N$  equivalent rel

or)  $A = \{1, 2, \dots, n\}, P(A) = \{ \emptyset, \{1\}, \{2\}, \dots, \{n\} \}$

$\leq \subseteq N \times N$  ref. anti-symmetric, transitive — partial order

or)  $A = \{1, 2, \dots, n\}, \begin{matrix} \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \end{matrix}$

Hasse diagram  
of partially ordered set  
(poset)

