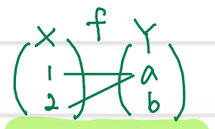
Study Title CH3. Functions. Sequences, and Relations. Date

※3.1 Functions

- function
  - Def: assigns to each member of set X exactly one member of set Y.

ex) 

{(1,a),(2,a)}

X = {1,2} Y = {a,b}

arrow diagram

  - Terms
    - Let X and B be sets as f: X→Y

      X: domain of f / Y: codomain of f
    - Modulus : remainder when x is dived by y

      ex) 2 mod 3 = 2
    - Floor : ⌊x⌋ is the greatest integer less then or equal to x

      ex) ⌊8.3⌋ = 8 ⌊-8.π⌋ = -9
    - One to one : If for all $x_1, x_2 \in X$, if $f(x_1)=f(x_2)$ then $x_1 = x_2$

Bijection
    - Onto Y : If for every $y \in Y$, there exists $x \in X$ such that $f(x)=y$ (surjective)
    - Inverse : If f is bijection, $f^{-1} = \{(y,x) \mid (x,y) \in f\}$
    - Composition : $h(x) = f(g(x)) = (f \circ g)(x)$

※3.2 Sequence and Strings

- Sequence
  - Def: special type of function in which the domain consists of integers.

Sub set of Integers

① notation : S_n instead of $s(n)$

↳ Index of the sequence.

② consecutive integer $\{k, k+1, \dots, j\}$ and the index of s is n, denote the sequence S as $\{s_n\}_{n=k}^{\infty}$

  - Type
    - finite sequence, infinite sequence
    - Increasing : for all i and j in the domain of s, if $i<j$, then $s_i < s_j$
    - non-decreasing : ", if $i<j$, $s_i \le s_j$
    - Decreasing : ", if $i<j$, $s_i > s_j$
    - non-increasing : ", if $i<j$, $s_i \ge s_j$
  - Subsequence : To retain only certain terms of the original sequence, maintaining the order of terms in the given sequence.

→ denoted $\{s_{n_i}\}$

  - Terms
    - $\sum_{i=m}^{n} a_i = a_m + a_{m+1} + \cdots + a_n$, Sum notation
    - $\prod_{i=m}^{n} a_i = a_m \cdot a_{m+1} \cdots a_n$, product notation

- Strings
  - def : finite sequence of characters, restricted to sequences composed of symbols drawn from a finite alphabet.

→ may be indexed from 0 or 1.

  - type
    - String over X : finite sequence of elements from X (X^*)
      - Null string : no elements strings (λ)
      - Non null string over X : X^+
  - Term
    - length : number of elements in string a. |a|
    - Concatenation : consisting of a followed by b. ab
    - Substring : Obtained by selecting some or all elements