Notes 4

Set—a collection of elements. Expressed by elements between braces. { }

- Elements can be anything, including sets. (A box can be in another box.)
- two options to specify a set
  - set-roster notation. S={1,2,3,…}
  - set-builder notation. S={x∈Z | x≥1}
- x ∈ S, x is an element of the set S
- A ⊆ B, A is a subset of the set B
- proper subset
- empty set Ø
  - distinguish Ø and {Ø} (an empty box v.s. a box that includes another box that is empty.)
- represent real number intervals by (,), [, and]
  - (and) means "no equal", called open interval
  - [and] means "can be equal", called closed interval
  - infinite notation ∞ and $-\infty$
    - ∞ and $-\infty$ are always open, i.e., always with (or) but not [or].
  - mutual disjoint set, partitions of sets, power set
- Venn Diagrams

Tuple--a sequence of ordered elements. Expressed by elements between parentheses. ( )

- Set v.s. Tuple
  - Set—unordered, no duplicate
  - Tuple—ordered, duplicates allowed
- n-tuple, $(x_1,x_2,\ldots x_n)$; 2-tuple—pair; 3-tuple—triple

Cartesian Products—$\mathrm{A} \times \mathrm{B} = \{(\mathrm{a}, \mathrm{b}) | \mathrm{a} \in \mathrm{A} \text{ and } \mathrm{b} \in \mathrm{B}\}$

$\mathrm{A}_1 \times \mathrm{A}_2 \times \ldots \times \mathrm{A}_n = \{(\mathrm{a}_1, \mathrm{a}_2, \ldots \mathrm{a}_n) | \mathrm{a}_1 \in \mathrm{A}_1, \mathrm{a}_2 \in \mathrm{A}_2 \text{ , and } \mathrm{a}_n \in \mathrm{A}_n\}$

Set operations

- union $A \cup B$, intersection $A \cap B$, difference (relative complement) $A - B$, complement A^c
- universal set U, $A^c = U - A$

$$\bigcup_{i=0}^{n} A_i = A_1 \cup A_2 \cup \ldots \cup A_n; \qquad \bigcap_{i=0}^{n} A_i = A_1 \cap A_2 \cap \ldots \cap A_n;$$

- set operations v.s. logic operators
  - union—or; intersection—and; complement—negation
  - Theorem 6.2.2 and Table 6.4.1.