

RESUME TEORI OTOMATA
PERTEMUAN 13 Februari 2025

▪ **Mathematical Preliminaries**

○ **Set**

- Set is a collection of elements.
- x is an element of set S .
- ex. $x \in S$
- Usual operation of set are union, intersection, and difference.

$$A = \{1, 2, 3, 4, 5, 6\}$$

$$B = \{6, 7, 8, 9, 10\}$$

$$\text{Union} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$\text{Intersection} = \{6\}$$

$$\text{Difference} = \{1, 2, 3, 4, 5\} \text{ atau } \{7, 8, 9, 10\}$$

○ **Functions and relations**

- Functions is a rule that assigns to elements of one set a unique elements of another sets.
- If f denotes a function, then the first set is called the comain of f , and the second set its range.

$$f: S1 \rightarrow S2$$

○ **Graph and Trees**

- Graph is a construct consisting of two finite sets, the set $v = \{v1, v2, \dots, vn\}$ of vertices and the set $E = \{e1, e2, \dots, en\}$ of edges.
- The graph with vertices $\{v1, v2, v3\}$ and edges $\{(v1, v3), (v3, v1), (v3, v2), (v3, v3)\}$

○ **Proof Techniques**

- **Proof by induction**
 - Base Case
 - Inductive Step
- **Proof by contradiction**
 - Assumption
 - Derivation
 - Conclusion

- **Language**

- Language is a set of strings which are chosen from Σ^* , where Σ is a particular alphabet. If Σ is an alphabet and $L \subseteq \Sigma^*$, then L is a language over Σ .

- **Grammar**

- Grammar for the English language tells us whether a particular sentences is well formed or not.
- $G = (V, T, S, P)$
 - V is finite set of objects called variables
 - T is finite set of objects called terminal symbols
 - $s \in V$ is a special symbol called the start variable
 - P is a finite set of productions

- **Automata**

- Automata theory is the study of abstract computing devices, or “machines”.

QUIZ 1

1. Carilah *union*, *intersection*, *difference*, dan *superset*

$$A = \{1, 2, 3, 4\}$$

$$B = \{3, 4, 5, 6\}$$

$$A \cup B = \{1, 2, 3, 4, 5, 6\}$$

$$A \cap B = \{3, 4\}$$

$$A - B = \{1, 2\}$$

$$P(A)$$

$$= \emptyset, \{1\}, \{2\}, \{3\}, \{4\}, \{1, 2\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{2, 4\}, \{3, 4\}, \{1, 2, 3\}, \{1, 2, 4\}, \{1, 3, 4\}, \{2, 3, 4\}, \{1, 2, 3, 4\}$$

$$P(B)$$

$$= \emptyset, \{3\}, \{4\}, \{5\}, \{6\}, \{3, 4\}, \{3, 5\}, \{3, 6\}, \{4, 5\}, \{4, 6\}, \{5, 6\}, \{3, 4, 5\}, \{3, 4, 6\}, \{3, 5, 6\}, \{4, 5, 6\}, \{3, 4, 5, 6\}$$

2. Carilah domain dan range $R = \{(1, 5), (2, 4), (2, 6), (3, 5)\}$

$$\text{Domain} = \{1, 2, 3\}$$

$$\text{Range} = \{4, 5, 6\}$$

3. Berapa hasil $f(x) = 2x + 3$ dengan domain $X = \{1, 2, 3, 4\}$

$$X = \{(1, 5), (2, 7), (3, 9), (4, 11)\}$$