Topic 1

Decision problems map strings/programs to Booleans

Finite automaton can be represented as a 5-tuple

$$M = (Q, \sum, \delta, q_0, F) \text{ where:}$$

$$Q = \text{set of states}$$

$$\sum = \text{alphabet}$$

$$\delta = \text{transition function}$$

$$q_0 = \text{start state}$$

$$F = \text{set of final states}$$

They can also be represented as a graph with states as nodes and transitions as edges or as a table with states as rows and alphabet as columns (see notes pg 2)

Set operations:

$$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$$
$$A \cap B = \{x \mid x \in A \text{ and } x \in B\}$$
$$\overline{A} = \{x \mid x \notin A\}$$
$$A^* = \{x_1 x_2 \cdots x_n \mid x_i \in A \text{ for all } i \in \{1, 2, \cdots, n\}\}$$
$$A \times B = \{(x, y) \mid x \in A \text{ and } y \in B\}$$
$$A \circ B = \{xy \mid x \in A \text{ and } y \in B\}$$