1. Differences — \( a + bc \) versus \( \{a, bc\} \)
2. Garbage Machines
   - \( Q \subseteq \Sigma, \delta, \delta_0, T \)
   - Acceptance
   - JFLAP simulation
   - Motivations
   - Relationship to RE
   - Conversion to DFA
   - Examples

EX 1

\[
\begin{align*}
Q &= \{A, B, C, D\} \\
\Sigma &= \{0, 1\} \\
\delta_0 &= A \\
T &= \{0, 1\}
\end{align*}
\]

\[
\begin{array}{c|cccc}
\delta & 0 & 1 & \epsilon \\
\hline
A & \{A\} & \{AB\} & \emptyset \\
B & \{C\} & \{C\} & \emptyset \\
C & \{D\} & \{D\} & \emptyset \\
D & \emptyset & \emptyset & \emptyset \\
\end{array}
\]

Acceptance

Any path labeled by the given string leading to some accept state
Motivations

- Makes it easier to specify nontrivial languages (Ex1, Ex4)
- Direct correspondence with RE

Conversion RE to NFA:

\[ \emptyset \rightarrow O \]
\[ \varepsilon \rightarrow O \]
\[ a \rightarrow O \]
\[ R_1 + R_2 \]
\[ R_1 R_2 \]
Same initial state as before (if it were final, keep it final)

Why not simply?
Consider $L = \{ x \mid |x| \geq 1 \text{ and every even position of } x \text{ is a } 1 \text{ and } x \in \{0, 1\}^* \}$. 

**EX 2**

\[
\begin{array}{ccc}
\rightarrow & 0, 1 & \rightarrow \\
\rightarrow & 0 \rightarrow & 0, 1 \\
\end{array}
\]

**Build $L^*$**.

**NFA for**

\[ \{ x \mid x \in \{0, 1\}^* \text{ has odd 1's or even 0's} \} \]
Conversion to DFA
NFA with $\varepsilon$

EX3

\[ A \xrightarrow{\varepsilon} B \xrightarrow{0,1} C \xrightarrow{0,1} D \xrightarrow{0,1} E \]

- $\delta$ table
- I-flop simulation
  - step by state
  - step with closure
- Conversion to DFA

Steps
1) DFA for \((0101)^*\)

![DFA Diagram]

2) NFA for all 0101 with a 1-bit error.

3) NFA for all 0101 with a 2-bit error.
As soon as you initialize $A$, you close into $A B$.
You do this whenever you land into $A$.

There is no $A$ state without a $B$ also occurring in the state (due to $E$ closure).