\[
\frac{56}{16} = \frac{16}{72}
\]

\[
\begin{bmatrix}
5 & 6 \\
1 & 7
\end{bmatrix}
\quad
\begin{bmatrix}
6 & 6 \\
2 & 2
\end{bmatrix}
\]

\[
\begin{bmatrix}
1 & 0 \\
0 & 1
\end{bmatrix}
\quad
\begin{bmatrix}
6 & 6 \\
1 & 1
\end{bmatrix}
\]
Regular language
DFA/NFA accept
Regular expressions
\( \epsilon, U, \ast \)
\((a \cup b)^\ast ba^*\) \{ abaaa, ab, bbou \}
R is a regular expression if R is:

1. a for some a ∈ Σ
2. ∅ - empty string
3. ∅ - no string
4. (R₁ ∪ R₂) R₁, R₂ are reg. expr.
5. (R₁ ∩ R₂) 1'
6. R₁* R₁ reg. expr
\( A \cup B C^* \)

precedence order \(*, 0, U\)

\( R^+ = RR^* \)

\( \Sigma^* \) any string over \( \Sigma \)

\( R^k = k \) occurrences of \( R \)

\( L(R) \) language defined by \( R \)
contain exactly 1 a \[ \Sigma = \{a, b\} \]
\[ b^* a b^* \]

contains string aba
\[ (a \cup b)^* aba (a \cup b)^* \]
\[ \Sigma^* aba \Sigma^* \]

even a's
\[ (b^* a b^* a b^*)^* \]

odd a's
\[ b^* a (\quad ) \]

1^* \emptyset = \emptyset
1^* \varepsilon = 1^*
\emptyset^* = \{ \varepsilon \}
R \cup \emptyset = R
A language is regular if and only if some regular expression defines it.

I. If a language is described by a regular expression, then it is regular.

Suppose \( R \) is a regular expression. Show \( L(R) \) is regular.

Construct an NFA that recognizes \( L(R) \)

6 cases:
1. \( R = a \) for some \( a \in \Sigma \)
   \[ L(R) = \varepsilon a \varepsilon \]

2. \( R = \varepsilon \)

3. \( R = \emptyset \)

4. \( R = R_1 \cup R_2 \)

5. \( R = R_1 \circ R_2 \) see other constructions

6. \( R = R_1^* \)
\[(a + b)^c\]