1. Consider the following two NFAs from Week 2 Lecture:

   (a) Convert the NFAs to DFAs:
   (b) What Languages do they accept?

2. Consider the grammar:

   1 \( bexpr \rightarrow bexpr \text{ or } bterm \)
   2 \( | \) \( bterm \)
   3 \( bterm \rightarrow bterm \text{ and } bfactor \)
   4 \( | \) \( bfactor \)
   5 \( bfactor \rightarrow \text{ not } bfactor \)
   6 \( | \) \( ( \ bexpr \ ) \)
   7 \( | \) \( \text{ true} \)
   8 \( | \) \( \text{ false} \)

   (a) What are the terminals, nonterminals and start symbol?
   (b) Construct the leftmost derivation for \textbf{not} (\textbf{false} and \textbf{true} or \textbf{true}).
   (c) Construct the rightmost derivation for the same expression
   (d) Construct a parse tree for for the same expression
   (e) What are the precedence and associativity for the three operators \textbf{or}, \textbf{and} and \textbf{not} implied in the grammar?
3. Suppose Productions 1 – 4 in Question 2 are deleted and replaced with:

\[
\begin{align*}
1 & \quad \text{bexpr} \rightarrow \text{bexpr and bterm} \\
2 & \quad \mid \text{bterm} \\
3 & \quad \text{bterm} \rightarrow \text{bterm or bfactor} \\
4 & \quad \mid \text{bfactor}
\end{align*}
\]

(a) Draw the parse tree for the same expression in Question 2.
(b) How has the change in the grammar affected the precedence of the boolean operators \textbf{or} and \textbf{and}?

4. Suppose Productions 1 – 4 in Question 2 are deleted and replaced with:

\[
\begin{align*}
\text{bexpr} \rightarrow & \quad \text{bexpr or bfactor} \\
& \quad \mid \text{bexpr and bfactor} \\
& \quad \mid \text{bfactor}
\end{align*}
\]

(a) Draw the parse tree for the expression in Question 2.
(b) Draw also the parse tree for for \textbf{not} (false \textbf{or} \textbf{true} and \textbf{true}).
(c) How has the change in the grammar affected the precedence of the boolean operators \textbf{or} and \textbf{and}?
(d) Is this grammar ambiguous?

5. Assume that the grammar in Question 2 is replaced with:

\[
\begin{align*}
1 & \quad \text{bexpr} \rightarrow \text{bexpr or bexpr} \\
2 & \quad \mid \text{bexpr and bexpr} \\
3 & \quad \mid \text{not bexpr} \\
4 & \quad \mid ( \text{bexpr} ) \\
5 & \quad \mid \text{true} \\
6 & \quad \mid \text{false}
\end{align*}
\]

(a) Show that this grammar is ambiguous by constructing two different parse trees (or two different leftmost derivations or two different rightmost derivations) for the expression in Question 2.
(b) What can you say about the precedence and associativity of \textbf{or}, \textbf{and} and \textbf{not} implied in the grammar?