1 Problems

Task 1. Please prove or disprove that an if statement could be replaced by a while statement in a programming language.

Task 2. The BNF rules for if-then-else statement are as follows:
\[ <\text{ifstmt}> \rightarrow \text{if} <\text{logicexpr}> \text{then} <\text{stmt}> \]
\[ \text{if} <\text{logicexpr}> \text{then} <\text{stmt}> \text{else} <\text{stmt}> \]
Please illustrate the parse tree of the following sentential form.
\[ \text{if} (\text{done}) \]
\[ \text{if} (!\text{denom}) \]
\[ \text{number} = 0; \]
\[ \text{else} \text{ number} = \text{sum}/\text{denom}; \]

Is this grammar ambiguous? Please illustrate the parse tree of the sentential form. If the grammar is ambiguous, please draw two parse trees.

Task 3. Prove that the following grammar is ambiguous:
\[ <\text{S}> \rightarrow <\text{A}> \]
\[ <\text{A}> \rightarrow <\text{A}> * <\text{A}> | <\text{id}> \]
\[ <\text{id}> \rightarrow x | y | z \]

Task 4. Given a grammar as follows:
\[ <\text{assign}> \rightarrow <\text{id}>=<\text{expr}> \]
\[ <\text{id}> \rightarrow A|B|C \]
\[ <\text{expr}> \rightarrow <\text{id}> + <\text{expr}> | <\text{id}> * <\text{expr}> | (<\text{expr}>) | <\text{id}> \]
Please show a parse tree for the following statement:
\[ A = A * (B * (C + A)) \]

Task 5. Perform the pairwise disjointness test for the following grammar rules.
\[ a. <\text{A}> \rightarrow aB|b|cBB \]
\[ b. <\text{B}> \rightarrow aB|bA|aBb \]
\[ c. <\text{C}> \rightarrow aaA|b|caB \]