CSCI 374, Summer 25 Homework #1

Due: June 15, 2025

* ABSOLUTELY NO LATE ASSIGNMENTS!

* Homework solutions MUST be TYPED, except for diagrams, which may be hand-drawn.

* Limit your answers to at MOST half a page per question (10 or 12 pt font). Short, concise answers are best.

* Answer the questions IN YOUR OWN WORDS!

Total: 20 points

#2(c). (2 points) Write EBNF descriptions for the following: C **`switch`** statement

#3. (2 points) Rewrite the BNF of Example 3.4 to give + precedence over * and force + to be right associative.

EXAMPLE 3.4 An Unambiguous Grammar for Expressions

```
<assign> → <id> = <expr>
<id> → A | B | C
<expr> → <expr> + <term>
        | <term>
<term> → <term> * <factor>
        | <factor>
<factor> → ( <expr> )
          | <id>
```

#6(a). (2 points) Using the grammar in Example 3.2, show a parse tree and a leftmost derivation for each of the following statements: `A = A * (B + (C * A))`

EXAMPLE 3.2 A Grammar for Simple Assignment Statements

```
<assign> → <id> = <expr>
<id> → A | B | C
<expr> → <id> + <expr>
        | <id> * <expr>
        | ( <expr> )
        | <id>
```

#8. (2 points) Prove that the following grammar is ambiguous:

<S> → <A>

<A> → <A> + <A> | <id>

<id> → a | b | c

#9. (2 points) Modify the grammar of Example 3.4 to add a unary minus operator that has higher precedence than either + or *.

EXAMPLE 3.4 An Unambiguous Grammar for Expressions

<assign> → <id> = <expr>
<id> → A | B | C
<expr> → <expr> + <term>
| <term>
<term> → <term> * <factor>
| <factor>
<factor> → (<expr>)
| <id>

#10. (2 points) Describe, in English, the language defined by the following grammar:

<S> → <A> <B> <C>

<A> → a <A> | a

<B> → b <B> | b

<C> → c <C> | c

#11. (2 points) Consider the following grammar:

<S> → <A> a <B> b

<A> → <A> b | b

<B> → a <B> | a

Which of the following sentences are in the language generated by this grammar?

1. baab
2. bbbab
3. bbaaaaas
4. bbaab

#15. (2 points) Convert the BNF of Example 3.1 to EBNF.

EXAMPLE 3.1 A Grammar for a Small Language

<program> → **begin** <stmt_list> **end**

<stmt_list> → <stmt>
| <stmt> ; <stmt_list>
<stmt> → <var> = <expression>
<var> → A | B | C
<expression> → <var> + <var>
| <var> - <var>
| <var>

#16. (2 points) Convert the BNF of Example 3.3 to EBNF.

EXAMPLE 3.3 An Ambiguous Grammar for Simple Assignment Statements

<assign> → <id> = <expr>
<id> → A | B | C
<expr> → <expr> + <expr>
| <expr> * <expr>
| (<expr>)
| <id>

#17. (2 points) Convert the following EBNF to BNF:

S→A{bA}

A→a[b]A