CS210 - Programming Languages
Homework #3 - Spring 2024

Due on or before Monday, February 12 at 2:30 PM

Name _____

1. Start with the grammar G6 from your textbook, repeated here:

```
<exp> ::= <exp> + <mulexp> | <mulexp>
<mulexp> ::= <mulexp> * <rootexp> | <rootexp>
<rootexp> ::= ( <exp> ) | a | b | c
```

Please modify the grammar G6 in the following ways:

- Add subtraction and division operators (- and /) with the customary precedence and associativity.
- Then add a left-associative operator % between + and * in precedence.
- Then add a right-associative operator = at lower precedence than any of the other operators.

Please note that you need not show the intermediate grammars produced as a result of each modification specified above; just provide the final grammar that is the result of modifying G6 as specified.

2. Prove that each of the following grammars is ambiguous:

Grammar H2a:

```
<person> ::= <woman> | <man>
<woman> ::= wilma | betty | <empty>
<man> ::= fred | barney | <empty>
```

Grammar H2b:

```
<S> ::= <S> <S> | ( <S> ) | ()
```