CS536 Homework 5
Due by 11:00 PM on Wed, Mar 1

Questions

Homework assignments must be done individually. Collaboration on homework assignments is *not* allowed.

This time you will be the grader for our homework assignment 3. One of the students *Ima Student* tried 5 times but (sadly) none of them are correct. Recall that for homework assignment 3 we defined the language of *regular expressions* as follows:

We only allow letters in *regular expressions* (that way we don't have to worry about how to specifiy characters that are the same as operators or things like newlines). As usual, we will allow ε (epsilon) in our regular expressions. The operators for our language of regular expressions are:

- | means "or" (alternation)
- writing two or more things next to each other means "followed by" (catenation)
- * means "zero or more" (closure or iteration)
- + means "one or more" (positive closure)
- ( ) are used for grouping

In a regular expression, * and + have the same, highest precedence, "followed by" has middle precedence, and | has the lowest precedence. All of the operators are left associative.

Below are Ima's efforts on the language of regular expressions. For each CFG, do ***one*** of the following:

a. Give one string that is a legal regular expression (given our definition above), but is not in the language of the CFG.
b. Give one string that is not a legal regular expression (given our definition above), but is in the language of the CFG.
c. Show that the CFG is ambiguous by drawing two different parse trees for some string in the language of the CFG.

For cases (a) and (b), be sure to say which of the two cases you are illustrating.

Note that the terminals are `LTR`, `EPS`, `OR`, `STAR`, `PLUS`, `LPAR`, and `RPAR`. Note also that there is a difference between the terminal `EPS` (which represents the token epsilon in our language of regular expressions) and the symbol ε (which is used on the right-hand-side of a grammar production indicating the non-terminal on the left-hand-side derives an empty sequence of symbols).

CFG 1:

```
expr → expr OR term | term
term → term item | item
item → expr STAR | expr PLUS | LTR | EPS | LPAR expr RPAR
```

CFG 2:

```
expr → LPAR expr RPAR | term
term → term OR factor | factor
```

```
factor → factor item | item
item → item STAR | item PLUS | LTR | EPS
```

CFG 3:

```
expr → expr OR term | term
term → term item | ε
item → item STAR | item PLUS | LTR | EPS | LPAR expr RPAR
```

CFG 4:

```
expr → expr OR term | term
term → term item | LPAR expr RPAR | item
item → item STAR | item PLUS | LTR | EPS
```

CFG 5:

```
expr → LTR | EPS | term
term → term OR factor | factor
factor → factor item | item
item → item STAR | item PLUS | LPAR item RPAR | expr
```

Handing in

Homework is to be submitted in the dropbox HW5 in Learn@uw. Please make sure that you submit the correct homework.