All students should read through to §4.5.1 of the textbook in preparation **for this assignment** and the next lecture.

Distribute the following questions across the members of your group. You will share your solutions (and most importantly the *method* of your solutions) during the next lecture period. Divide up the questions so that **each** question has at least two solutions from different group members.

1. Page 138, question 3
2. Page 139, question 5. Hints: (i) this question's notation describes the grammars as the elements of $G(N,\Sigma,P,S)$; see §4.1 of the text; (ii) you can "describe" a language by explicitely stating all acceptable input strings, you could either right them all down, show a regular expression (in the book's notation please) that would match any acceptable input strings, or in an extreme case show an algorithm that could generate all possible input strings.
3. Page 139, question 7. Hint: for part c with respect to associativity, consider a left or right derivation of the following inputs

   i. *num plus num plus num*

   ii. *num times num times num*

   Don't assume this language's associativity of *plus* and *times* matches our real world arithmetic view!
4. Page 139, question 8
5. Consider the grammar:

$$
\begin{array}{lcl}
S & \rightarrow & A\ R\ X\ \$ \\
A & \rightarrow & b \\
 & | & c \\
 & | & \lambda \\
X & \rightarrow & x \\
 & | & z \\
R & \rightarrow & R\ T \\
 & | & T \\
T & \rightarrow & y\ s \\
 & | & a\ s \\
 & | & \lambda
\end{array}
$$

   (a) For the following sequence of tokens, show the left-most **and** right-most derivations, and their generated parse trees.

   i. Tokens: `b a s y s a s z`

   ii. Tokens: `y s x`

   Does this language appear to be ambiguous? Why?

   (b) How can you change the grammar, **specifically the set of production rules** P, so that the grammar no longer appears ambiguous?