This homework assignment is a written assignment that should be turned in at the beginning of class on Thursday February 19.

1. Consider the following augmented grammar of expressions.

$$
\begin{aligned}
S' &\rightarrow E \\
E &\rightarrow \textbf{id} \\
E &\rightarrow \textbf{id (} E \textbf{)} \\
E &\rightarrow E \star \textbf{id}
\end{aligned}
$$

   (a) Build the LR(0) DFA (*i.e.*, states and goto edges) for the grammar. Your answer should clearly define the set of LR(0) items for each state and include a diagram of the DFA.

   (b) Give the LR(0) action and goto tables for the grammar (remember that the goto table is different from the goto edges!). Is this grammar LR(0)? If not, why?

   (c) Is this grammar SLR? If not, why?

   (d) Is this grammar LR(1)? If not, why?

2. FLang (the language you are implementing in the project) does not have mutually recursive definitions (either functions or data types). Assume that we extended the abstract syntax to include the definition of mutually recursive functions:

$$
\begin{aligned}
bind \quad ::= \quad &\textbf{fun } f_1 \ fnsig_1 = exp_1 \ \textbf{and } \cdots \ \textbf{and } f_n \ fnsig_n = exp_n \\
\mid \quad &\cdots
\end{aligned}
$$

   What would be the typing rule for this more general function-definition form?