

CSC 340: Programming Language and Compilation  
Homework #2

First and Follow Sets

Due Date: Feb 25<sup>th</sup> Before 1:00 PM through LMS

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Compute FIRST and FOLLOW for each of the following grammars.

1.  $S \rightarrow 0 S 1 \mid 0 1$

$\text{First}(S) = \{0\}$

$\text{Follow}(S) = \{\$, 1\}$

2.  $S \rightarrow S + S \mid S S \mid (S) \mid S^* \mid a$

$\text{First}(S) = \{(, a\}$

$\text{Follow}(S) = \{\$, +, (, a), *\}$

3.  $S \rightarrow S S + \mid S S^* \mid a$

$\text{First}(S) = \{a\}$

$\text{Follow}(S) = \{\$, a, +, *\}$

4.  $S \rightarrow (L) \mid a$

$L \rightarrow L, S \mid S$

$\text{First}(S) = \{(, a\}$

$\text{Follow}(S) = \{\$, \text{Follow}(L)\} = \{\$, ), ', '\}$

$\text{First}(L) = \{\text{First}(S)\} = \{(, a\}$

$\text{Follow}(L) = \{), ', '\}$

5.  $S \rightarrow Sx$

$S \rightarrow S,y$

$S \rightarrow y$

$\text{First}(S) = \{y\}$

$\text{Follow}(S) = \{\$, x, ', '\}$

6.  $S \rightarrow S(S)S$

$S \rightarrow \epsilon$

$\text{First}(S) = \{\epsilon, \text{first}('S(S)S')\} = \{\epsilon, (\}$  // After substituting Epsilon in the right side, we get: '('

$\text{Follow}(S) = \{\$, (\}$

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7.  $E \rightarrow TE'$   
 $E' \rightarrow +TE' \mid \epsilon$   
 $T \rightarrow FT'$   
 $T' \rightarrow *FT' \mid \epsilon$   
 $F \rightarrow (E) \mid id$

$First(E) = \{First(T)\}$

$First(E') = \{+, \epsilon\}$

$First(T) = First(F)$

$First(T') = \{*, \epsilon\}$

$First(F) = \{(, id\}$

$Follow(E) = \{\$, \}$

$Follow(E') = \{Follow(E)\}$

$Follow(T) = \{first(E') = +, Follow(E) = \$, \}$  //  $First(E') - \epsilon$

$Follow(T') = Follow(T)$

$Follow(F) = \{first(T') = *, follow(T) = +, \$, \}$