

First-follow, LL(1)

Grammar,

$$E \rightarrow E + T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow (E) \mid id$$

Thus, $E \rightarrow E + T$

$$E \rightarrow T$$

$$T \rightarrow T * F \mid F$$

$$T \rightarrow F$$

$$F \rightarrow (E)$$

$$F \rightarrow id$$

S-1: Elimination of Left Recursion

$$E \rightarrow E + T \mid T$$

$$E \rightarrow TE'$$

$$E' \rightarrow +TE' \mid \epsilon$$

$$T \rightarrow T * F \mid F$$

$$T \rightarrow FT'$$

$$T' \rightarrow *FT' \mid \epsilon$$

$$E \rightarrow TE'$$

$$E' \rightarrow +TE' \mid \epsilon$$

$$T \rightarrow FT'$$

$$T' \rightarrow *FT' \mid \epsilon$$

$$F \rightarrow (E)$$

$$F \rightarrow id$$

S-02: calculation of first and follow set

First set

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

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

$$\text{First}(T) = \{ (, id \}$$

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

$$\text{First}(E) = \{ (, id \}$$

Follow set

$$\text{follow}(E) = \{ \epsilon, \text{end} \} \{ \rangle, \$ \}$$

$$\text{follow}(E') = \{ \rangle, \$ \}$$

$$\text{follow}(T) = \text{follow}(E') \cup \text{first}(E') = \{ +, \rangle, \$ \}$$

$$\text{follow}(T') = \text{follow}(T) \cup \text{follow}(T') = \{ +, \rangle, \$ \}$$

$$\text{follow}(F) = \text{first}(T') = \{ (, +, \rangle, \$ \}$$

Parsing Table

(Note: a wrong follow given)

			()	id	\$
T	+	*	$E \rightarrow TE'$		$E \rightarrow TE'$	
E				$E \rightarrow \omega$		$E \rightarrow \omega$
E'		$E' \rightarrow +TE'$			$T \rightarrow FT'$	
T			$T \rightarrow FT'$			$T' \rightarrow \omega$
T'	$T' \rightarrow \omega$	$T' \rightarrow *FT'$		$T' \rightarrow \omega$		
F			$F \rightarrow (E)$		$F \rightarrow (E)$	

result: Table does not contain multiple constraints. Thus
grammar is LL(1)

string validation:

given, string, $id + id * id \$$

stack	Input	Moves
\$	$id + id * id \$$	$E \rightarrow E + T$
$\$ T + E$	$id + id * id \$$	$E \rightarrow T$
$\$ T + T$	$id + id * id \$$	$T \rightarrow f$
$\$ T + f$	$id + id * id \$$	$f \rightarrow id$
$\$ T + id$	$id + id * id \$$	pop 'id'
$\$ T +$	$+ id * id \$$	pop '+'
$\$ T$	$id * id \$$	$T \rightarrow T * f$
$\$ f * T$	$id * id \$$	$T \rightarrow f$
$\$ f * f$	$id * id \$$	$f \rightarrow id$
$\$ f * id$	$id * id \$$	pop 'id'
$\$ f *$	$* id \$$	pop '*'
$\$ f$	$id \$$	$f \rightarrow id$
$\$ id$	$id \$$	pop 'id'
$\$$	$\$$	Complete