

Example 01

$E \rightarrow TE'$	$\text{First}(E) \rightarrow$
$E' \rightarrow +TE' \mid \epsilon$	$\text{First}(E') \rightarrow$
$T \rightarrow FT'$	$\text{First}(T) \rightarrow \{\text{id}, (\}$
$T' \rightarrow +FT' \mid \epsilon$	$\text{First}(T') \rightarrow \{+, \epsilon \}$
$F \rightarrow \text{id} \mid (E)$	$\text{First}(F) \rightarrow \{\text{id}, (\}$

Explanation:

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

There are two production rule where F is the production head:

For $F \rightarrow \text{id}$, the production body starts with a terminal **id**

For $F \rightarrow (E)$, the production body starts with a terminal (

$\text{First}(T') \rightarrow \{+, \epsilon \}$

There are two production rule where T' is the production head:

For $T' \rightarrow +FT'$, the production body starts with a terminal +

For $T' \rightarrow \epsilon$, the production body is ϵ , whenever a nonterminal derives ϵ , we place ϵ in FIRST for that nonterminal.

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

There is one production rule where T is the production head:

$T \rightarrow FT'$, the production body starts with a non terminal F so everything $\text{FIRST}(F)$ is surely in $\text{FIRST}(T)$.

$E \rightarrow TE'$	$\text{First}(E) \rightarrow \{id, (\}$
$E' \rightarrow +TE' \mid \epsilon$	$\text{First}(E') \rightarrow \{+, \epsilon\}$
$T \rightarrow FT'$	$\text{First}(T) \rightarrow \{id, (\}$
$T' \rightarrow +FT' \mid \epsilon$	$\text{First}(T') \rightarrow \{+, \epsilon\}$
$F \rightarrow id \mid (E)$	$\text{First}(F) \rightarrow \{id, (\}$

Explanation:

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

There are two production rule where E' is the production head:

For $E' \rightarrow +TE'$, the production body starts with a terminal $+$

For $E' \rightarrow \epsilon$, the production body is ϵ , whenever a nonterminal derives ϵ , we place ϵ in FIRST for that nonterminal

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

There is one production rule where E is the production head:

For $E \rightarrow TE'$, the production body starts with a non terminal T so everything $\text{FIRST}(T)$ is surely in $\text{FIRST}(E)$.

$E \rightarrow TE'$	$\text{Follow}(E) \rightarrow \{), \$\}$
$E' \rightarrow +TE' \mid \epsilon$	$\text{Follow}(E') \rightarrow \{), \$\}$
$T \rightarrow FT'$	$\text{Follow}(T) \rightarrow$
$T' \rightarrow +FT' \mid \epsilon$	$\text{Follow}(T') \rightarrow$
$F \rightarrow \text{id} \mid (E)$	$\text{Follow}(F) \rightarrow$

Explanation:

$\text{Follow}(E) \rightarrow \{), \$\}$

There is one production rule where E is being followed.

For $F \rightarrow (E)$, E is being followed by a terminal)

and as E is the start symbol there should be \$ in the $\text{Follow}(E)$

$\text{Follow}(E') \rightarrow \{), \$\}$

There are two production rules where E' is being followed.

For $E \rightarrow TE'$, since E' is at the end of the production, so $\text{FOLLOW}(E') = \text{FOLLOW}(E)$.

For $E' \rightarrow +TE'$, since E' is at the end of the production, so $\text{FOLLOW}(E') = \text{FOLLOW}(E')$.

$E \rightarrow TE'$	$\text{Follow}(E) \rightarrow \{), \$\}$
$E' \rightarrow +TE' \mid \epsilon$	$\text{Follow}(E') \rightarrow \{), \$\}$
$T \rightarrow FT'$	$\text{Follow}(T) \rightarrow \{+,), \$\}$
$T' \rightarrow +FT' \mid \epsilon$	$\text{Follow}(T') \rightarrow \{+,), \$\}$
$F \rightarrow \text{id} \mid (E)$	$\text{Follow}(F) \rightarrow$

Explanation:

$\text{Follow}(T) \rightarrow \{+,), \$\}$

There are two production rules where T is being followed.

For $E \rightarrow TE'$, since E' is following T, so $\text{FOLLOW}(T) = \text{FIRST}(E')$. But we can see that in the $\text{FIRST}(T)$ there is ϵ , and we also know that ϵ can not be in a follow set. So, let's see who is after E' . As we can see that there are no one after T' , so we will go to the head of the production rule, so $\text{FOLLOW}(T) = \text{FOLLOW}(E)$.

For $E' \rightarrow +TE'$, E' is following T, so $\text{FOLLOW}(T) = \text{FIRST}(E')$. But ϵ can not be in the follow set and no one is following T anymore, we will go to the production head and will take followset of E'

$\text{Follow}(T') \rightarrow \{+,), \$\}$

There are two production rules where T' is being followed.

For $T \rightarrow FT'$ since T' is at the end of the production, so $\text{FOLLOW}(T') = \text{FOLLOW}(T)$

For $T' \rightarrow +FT'$, since T' is at the end of the production, so $\text{FOLLOW}(T') = \text{FOLLOW}(T)$

$E \rightarrow TE'$	$\text{Follow}(E) \rightarrow \{), \$\}$
$E' \rightarrow +TE' \mid \epsilon$	$\text{Follow}(E') \rightarrow \{), \$\}$
$T \rightarrow FT'$	$\text{Follow}(T) \rightarrow \{+,), \$\}$
$T' \rightarrow +FT' \mid \epsilon$	$\text{Follow}(T') \rightarrow \{+,), \$\}$
$F \rightarrow \text{id} \mid (E)$	$\text{Follow}(F) \rightarrow \{+,), \$\}$

Explanation:

$\text{Follow}(F) \rightarrow \{+,), \$\}$

There are two production rules where F is being followed.

For $T \rightarrow FT'$, T' is following F so $\text{FOLLOW}(F) = \text{FIRST}(T')$. But we can see that in the $\text{FIRST}(T')$ there is ϵ , and we also know that ϵ can not be in a follow set. So, let's see who is after T' . As we can see that there are no one after T' , so we will go to the head of the production rule, so $\text{FOLLOW}(F) = \text{FOLLOW}(T)$.

For $T' \rightarrow +FT'$, T' is following F so $\text{FOLLOW}(F) = \text{FIRST}(T')$. But we can see that in the $\text{FIRST}(T')$ there is ϵ , and we also know that ϵ can not be in a follow set. So, let's see who is after T' . As we can see that there are no one after T' , so we will go to the head of the production rule, so $\text{FOLLOW}(F) = \text{FOLLOW}(T)$.

Example 02

$S \rightarrow Aa$	$\text{First}(S) \rightarrow \{b, d, a\}$
$A \rightarrow BD$	$\text{First}(A) \rightarrow \{b, d, \epsilon\}$
$B \rightarrow b \mid \epsilon$	$\text{First}(B) \rightarrow \{b, \epsilon\}$
$D \rightarrow d \mid \epsilon$	$\text{First}(D) \rightarrow \{d, \epsilon\}$

Explanation:

$\text{First}(D) \rightarrow \{d, \epsilon\}$

There are two production rule where D is the production head:

For $D \rightarrow d$, the production body starts with a terminal **d**

For $F \rightarrow \epsilon$, the production body is ϵ , whenever a nonterminal derives ϵ , we place ϵ in FIRST for that nonterminal

$\text{First}(B) \rightarrow \{b, \epsilon\}$

There are two production rule where B is the production head:

For $B \rightarrow b$, the production body starts with a terminal **b**

For $B \rightarrow \epsilon$, the production body is ϵ , whenever a nonterminal derives ϵ , we place ϵ in FIRST for that nonterminal

$\text{First}(A) \rightarrow \{b, d, \epsilon\}$

There is one production rule where A is the production head:

For $A \rightarrow BD$, the production body starts with a non terminal B so everything in $\text{FIRST}(B)$ is surely in $\text{FIRST}(A)$. As, in $\text{First}(B)$ there is ϵ , add the non ϵ symbols of $\text{FIRST}(D)$, again in $\text{First}(D)$ there is ϵ and as there are no nonterminal left add ϵ to $\text{First}(A)$

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$S \rightarrow Aa$	$\text{First}(S) \rightarrow \{b, d, a\}$
$A \rightarrow BD$	$\text{First}(A) \rightarrow \{b, d, \epsilon\}$
$B \rightarrow b \mid \epsilon$	$\text{First}(B) \rightarrow \{b, \epsilon\}$
$D \rightarrow d \mid \epsilon$	$\text{First}(D) \rightarrow \{d, \epsilon\}$

Explanation:

$\text{First}(S) \rightarrow \{b, d, a\}$

There is one production rule where S is the production head:

For $S \rightarrow Aa$, the production body starts with a non terminal A, so everything $\text{FIRST}(A)$ is surely in $\text{FIRST}(S)$. As, in $\text{First}(A)$ there is ϵ , so add a in the first set.

$S \rightarrow Aa$	$\text{Follow}(S) \rightarrow \{\$\}$
$A \rightarrow BD$	$\text{Follow}(A) \rightarrow \{a\}$
$B \rightarrow b \mid \epsilon$	$\text{Follow}(B) \rightarrow \{d, a\}$
$D \rightarrow d \mid \epsilon$	$\text{Follow}(D) \rightarrow$

Explanation:

$\text{Follow}(S) \rightarrow \{\$\}$

S is not being followed anywhere. But as S is the start symbol there should be \$ in the $\text{Follow}(S)$

$\text{Follow}(A) \rightarrow \{a\}$

There are one production rule where A is being followed.

For $S \rightarrow Aa$, a is following A.

$\text{Follow}(B) \rightarrow$

There are one production rule where B is being followed.

For $A \rightarrow BD$, D is following B, So, $\text{Follow}(B) = \text{First}(D)$. But we can see that in the $\text{FIRST}(D)$ there is ϵ , and we also know that ϵ can not be in a follow set. So, let's see who is after D. As we can see that there are no one after D, so we will go to the head of the production rule, so $\text{FOLLOW}(B) = \text{FOLLOW}(A)$.

$S \rightarrow Aa$	$\text{Follow}(S) \rightarrow \{\$ \}$
$A \rightarrow BD$	$\text{Follow}(A) \rightarrow \{a\}$
$B \rightarrow b \mid \epsilon$	$\text{Follow}(B) \rightarrow \{d, a\}$
$D \rightarrow d \mid \epsilon$	$\text{Follow}(D) \rightarrow \{a\}$

Explanation:

$\text{Follow}(S)D \rightarrow \{\$ \}$

S is not being followed anywhere. But as S is the start symbol there should be \$ in the $\text{Follow}(S)$

$\text{Follow}(D) \rightarrow \{a\}$

There are one production rule where D is being followed.

For $A \rightarrow BD$, there are no one after D, so we will go to the head of the production rule, so $\text{FOLLOW}(D) = \text{FOLLOW}(A)$.