Homework #2 - FIRST & FOLLOW Sets

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1. Use the following context-free grammar and answer the questions.

A) Calculate FIRST set for each non-terminal and terminal.

Use

1-IF X is a terminal (token), FIRST(X) = {X}

2-IF X->ε, then ε ∈ FIRST(X)

3-Iterate until no more terminals or ε can be added to any FIRST(X)

if X → y1y2 ... yk then

a ∈ FIRST(X) if a ∈ FIRST(yi) and ε ∈ FIRST(yh) for all 1 ≤ h < i

ε ∈ FIRST(X) if ε ∈ FIRST(yi) for all 1 ≤ i ≤ k

End iterate.

FIRST(G) = FIRST(E)

FIRST(E) = FIRST(T)

FIRST(T) = FIRST(F)

FIRST(F) = {id, num} (by 1)

FIRST(Tp) = {*, /, EOF} (by 1 and 2)

FIRST(T) = {id, num}

FIRST(Ep) = {+, -, EOF} (by 1 and 2)

FIRST(E) = {id, num}

FIRST(G) = {id, num}

B) Calculate FOLLOW set for each non-terminal.

Use

1-EOF ∈ FOLLOW(S)

2-Iterate until no more terminals can be added to any FOLLOW(X)

If A → αB, then put FOLLOW(A) in FOLLOW(B) (2-1)

If A → αBβ, then put {FIRST(β) - ε} in FOLLOW(B) (2-2)

If A → αBβ and ε ∈ FIRST(β), then put FOLLOW(A) in FOLLOW(B) (2-3)

End iterate

FOLLOW(G) = {EOF} (by 1)

FOLLOW(E) = FOLLOW(G) = {EOF} (by 2-1)

FOLLOW(Ep) = FOLLOW(E) = {EOF} (by 2-1)

FOLLOW(T) = FIRST(Ep) (by 2-2) + FOLLOW(E) (by2-3) = {+, -, EOF}

FOLLOW(Tp) = FOLLOW(T) = {+, -, EOF} (by 2-1)

FOLLOW(F) = FIRST(Tp) (by 2-2) + FOLLOW(T) (by 2-3)= {*, /, +, -, EOF}