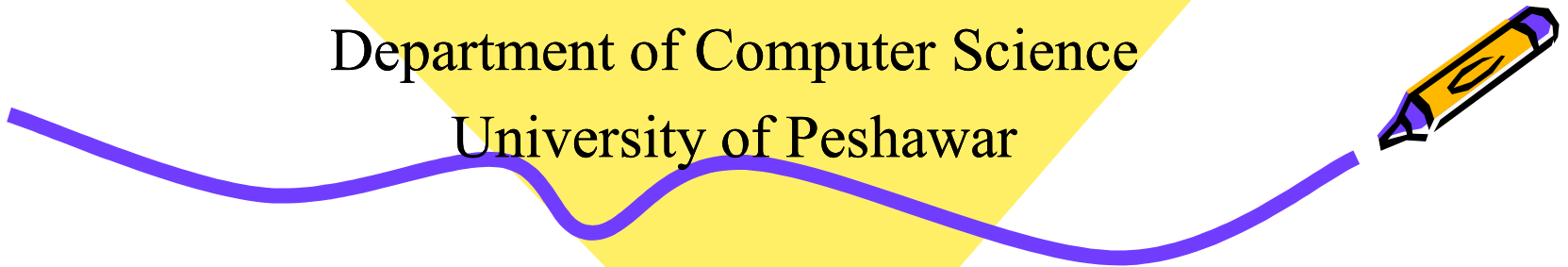# Chapter # 5.1
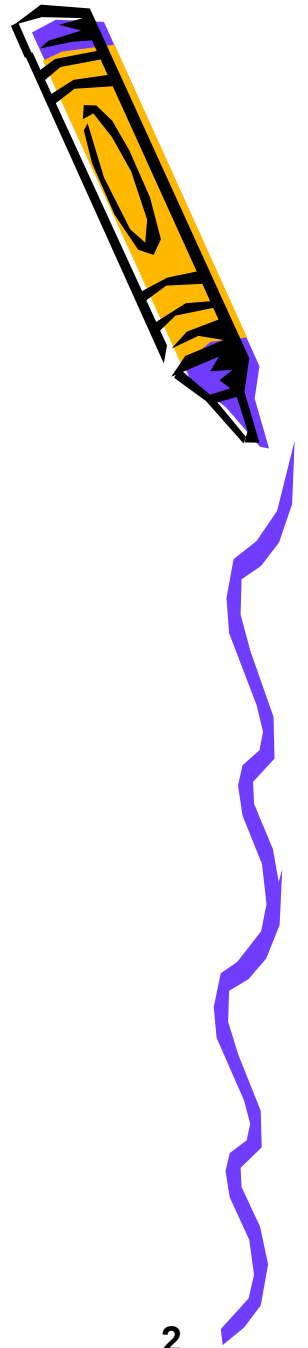# Top Down Parse Table Construction

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Example

- Consider the following Grammar

  1. $E \rightarrow E + T$
  2. $E \rightarrow T$
  3. $T \rightarrow T * F$
  4. $T \rightarrow F$
  5. $F \rightarrow (E)$
  6. $F \rightarrow id$

- Is there left recursion in this grammar?

Example

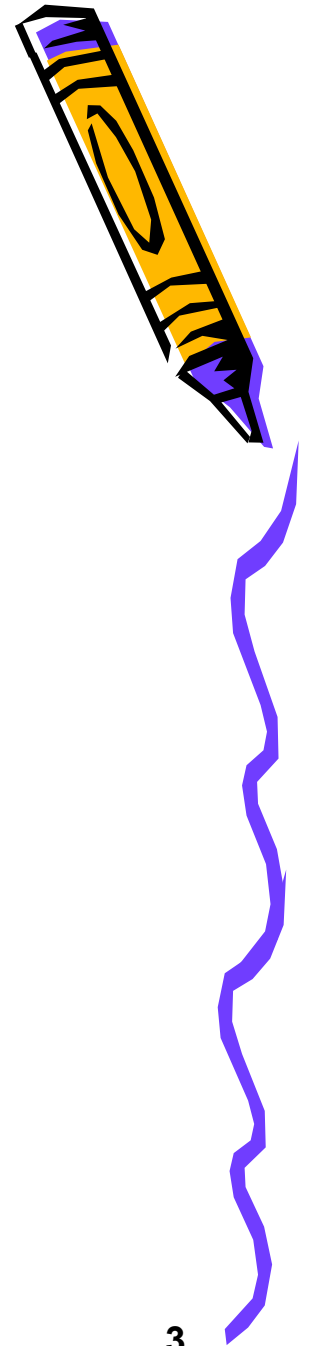- Grammar after removing left recursion

  1. $E \rightarrow TX$
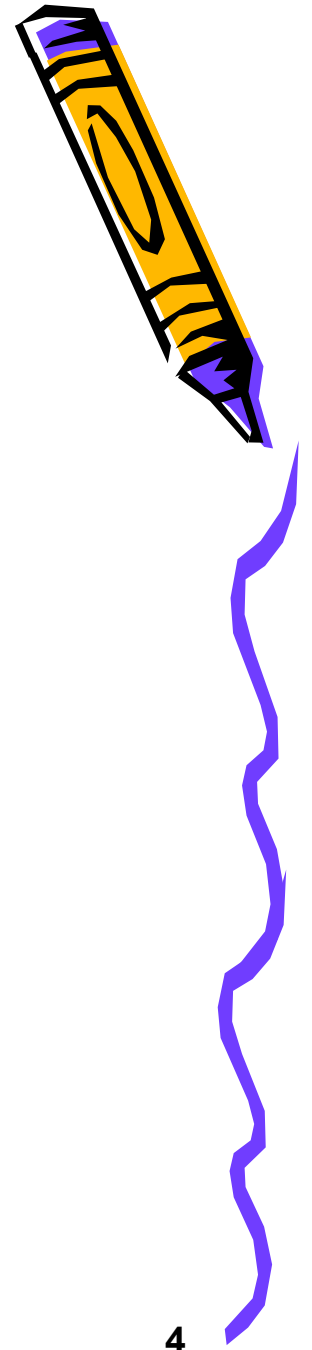 2. $X \rightarrow +TX \mid \varepsilon$
  3. $T \rightarrow FY$
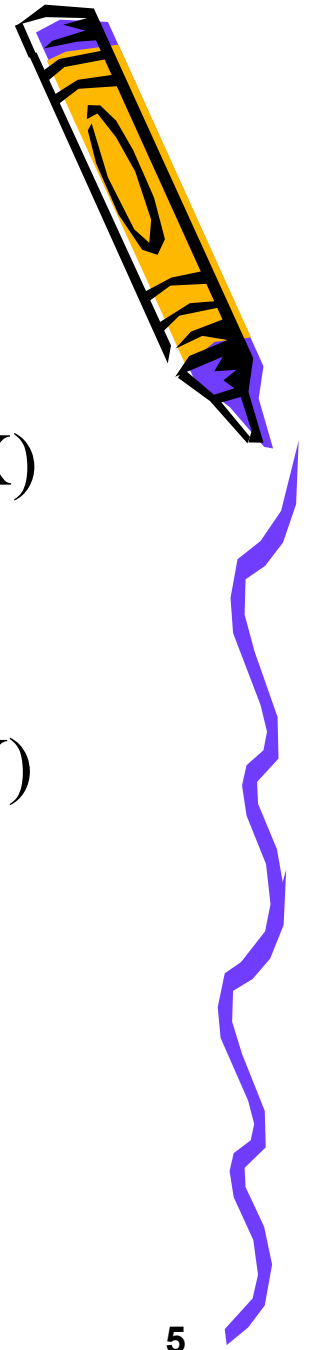 4. $Y \rightarrow *FY \mid \varepsilon$
  5. $F \rightarrow (E) \mid id$

First Set

- FIRST(E) = FIRST(T) = FIRST(F) = {(, id}
- FIRST(T) = {(, id}
- FIRST(F) = {(, id}
- FIRST(X) = {+, ε}
- FIRST(Y) = {*, ε}
- FIRST(( ) = {(}
- FIRST (id) = {id}
- FIRST (+) = {+}
- FIRST (-) = {-}
- FIRST ( )) = {)}

Follow Set

- FOLLOW(E) = {$,)}
- FOLLOW(X) = FOLLOW(E) = {$,)}
- FOLLOW(T) = (FIRST(X) – ε) U FOLLOW(X) = {$,), +}
- FOLLOW(Y) = FOLLOW(T) = {$,), +}
- FOLLOW(F) = (FIRST(Y) – ε) U FOLLOW(Y) = {$,), +, *}

Parse Table

	ID	+	*	(	)	$
E	E –> TX			E –> TX		
X		X –> +TX			X –> ε	X –> ε
T	T –> FY			T –> FY		
Y		Y –> ε	Y –> *FT		Y –> ε	Y –> ε
F	F –> id			F –> (E)		

Example 2

Grammar:

1. S → A a
2. A → B D
3. B → b
4. B → ε
5. D → d
6. D → ε

First Set

First(S) = {b, d, ε }
First(A) = {b, d, ε }
First(B) = {b, ε }
First(D) = {d, ε }

Follow Set

Follow(S) = {$}
Follow(A) = {a}
Follow(B) = {d, a}
Follow(D) = {a}

Follow Set

	a	b	d	$
S	1	1	1	
A	2	2	2	
B	4	3	4	
D	6		5	