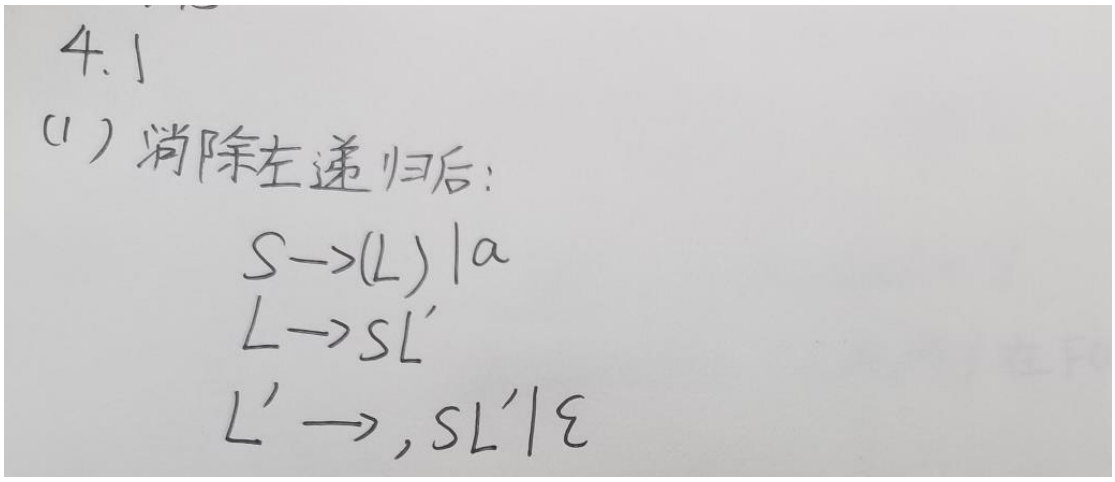
Exercise 4.1

- Given the following grammar

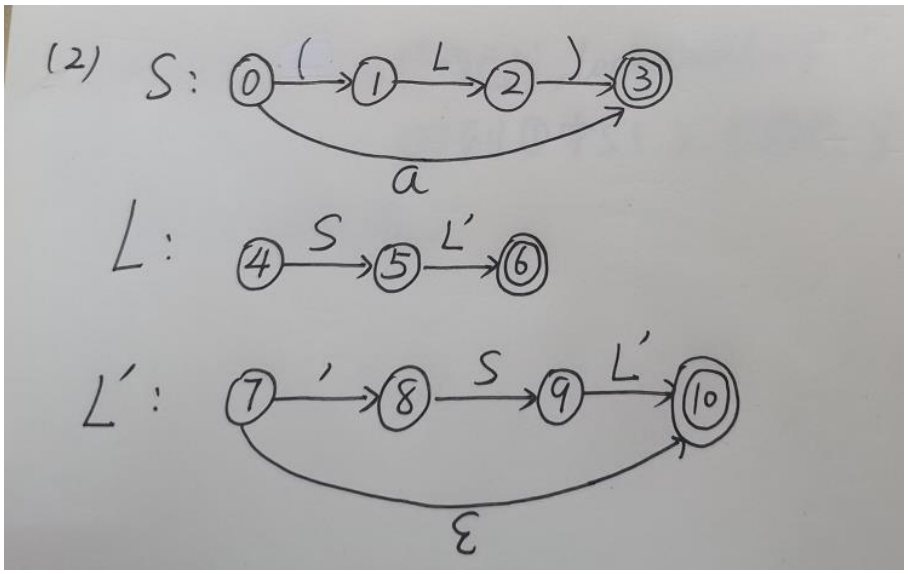
$$S \rightarrow (L) \mid a$$

$$L \rightarrow L, S \mid S$$

  - Eliminate left recursions in the grammar.
  - Draw the transition diagrams for the grammar.
  - Write a recursive descent predictive parser.
  - Indicate the procedure call sequence for an input sentence `(a, (a, a))`.



4.2



4.3：

对于 S：

```
void S( ) {
    if ( lookahead == '(' ) {
        match( '(' );
        L( );
        match( ' )' );
    }
    else if ( lookahead == a ) {
        match( a );
    }
    else{
        error( );
    }
}
```

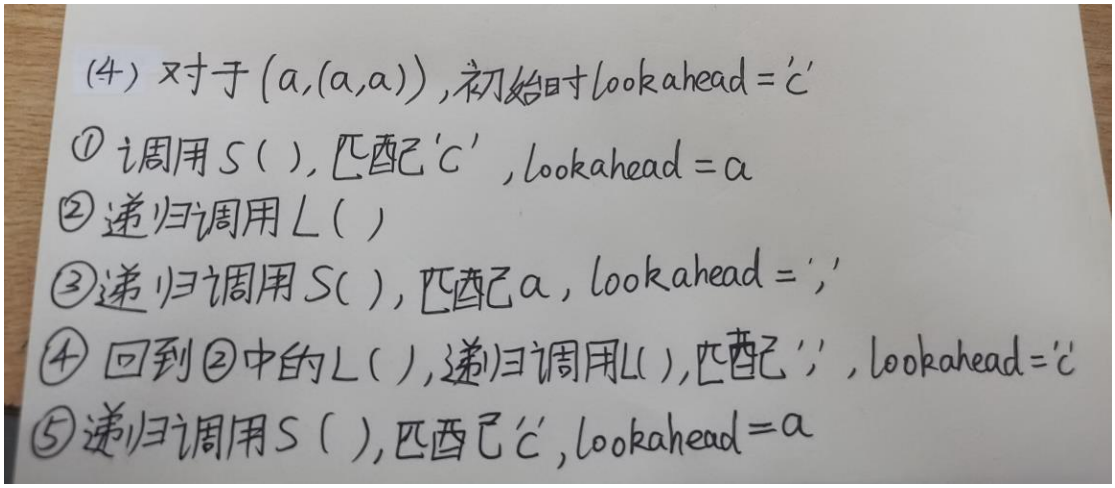
对于 L’：

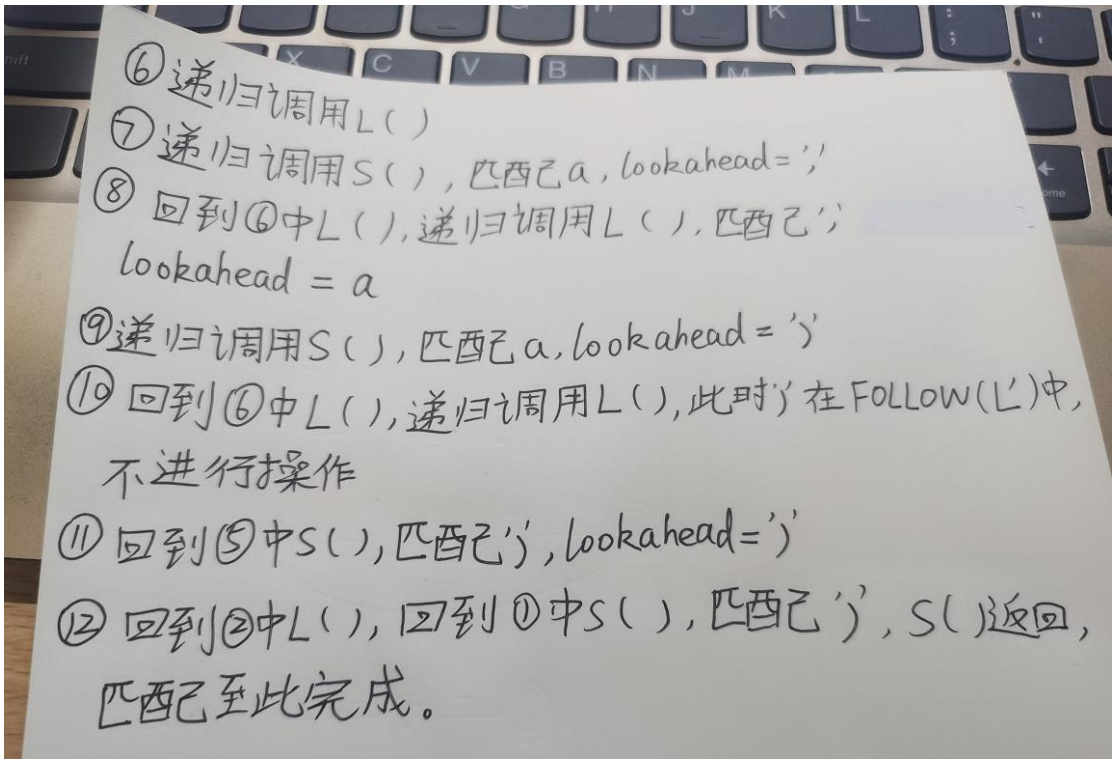
```
void L1( ) {
    if ( lookahead == ',' ) {
        match( ',' );
        S( );
        L1( );
    }
    else if ( lookahead in FOLLOW(L') ) {
    }
    else{
        error( );
    }
}
```

对于 L：

```
void L1( ) {
    S();
    L1();
}
```

4.4：


(4) 对于(a,(a,a)),初始时lookahead='c'
①调用S(),匹配'c',lookahead=a
②递归调用L()
③递归调用S(),匹配a,lookahead=','
④回到②中的L(),递归调用L(),匹配',',lookahead='c'
⑤递归调用S(),匹配'c',lookahead=a


⑥递归调用L()
⑦递归调用S(),匹配a,lookahead=','
⑧回到⑥中L(),递归调用L(),匹配',' lookahead=a
⑨递归调用S(),匹配a,lookahead=')'
⑩回到⑥中L(),递归调用L(),此时')'在FOLLOW(L')中,不进行操作
⑪回到⑤中S(),匹配')',lookahead=')'
⑫回到②中L(),回到①中S(),匹配')',S()返回,匹配至此完成。

Exercise 4.2

- Consider the context-free grammar

$$S \rightarrow aSbS \mid bSaS \mid \varepsilon$$

  - Can you construct a predictive parser for the grammar? and why?

答：不能，因为这个语法有二义性且含有左递归。

Exercise 4.3

- Compute the FIRST and FOLLOW for the start symbol of the following grammar

$$S \rightarrow SS+ \mid SS* \mid a$$