Exercise 4
Recursive Descent Parser

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1 Grammar

$$E \to TE'$$
$$E' \to +TE' \mid \epsilon$$
$$T \to FT'$$
$$T' \to *FT' \mid \epsilon$$
$$F \to id \mid (E)$$

2 C Program

```c
#include<stdio.h>
#include<stdlib.h>
void E();
void Eprime();
void T();
void Tprime();
void F();
char s;
int pos = 0; // Position starts at 0
void parse(char c)
{
    if(s == c) {
        s = getchar();
    }
    else {
        printf("Error at position %d!\n", pos);
        exit(0);
    }
}
```

```c
void E()
{
    T();
    Eprime();
}
void Eprime()
{
    if(s == '+') {
        pos++;
        parse('+');
        T();
        Eprime();
    }
}
void T()
{
    F();
    Tprime();
}
void Tprime()
{
    if(s == '*') {
        pos++;
        parse('*');
        F();
        Tprime();
    }
}
void F()
{
    if(s == '(') {
        pos++;
        parse('(');
        E();
        pos++;
        parse(')');
    }
    else if(s == 'i') {
        pos++;
        parse('i'); parse('d');
    }
    else {
        printf("Error at position %d!\n", pos);
        exit(0);
    }
}
```

```c
int main()
{
    printf("Enter string to parse: ");
    s = getchar();
    E();
    printf("Parsed successfully!\n");
    return 0;
}
```

3   Sample Input & Output

```
$ ./rdparser.out
Enter string to parse: id+(id*id+(id)+id*(id+id))
Parsed successfully!
$ ./rdparser.out
Enter string to parse: id+id**
Error at position 4!
$ ./rdparser.out
Enter string to parse: *
Error at position 0!
$ ./rdparser.out
Enter string to parse: id*id*id*id+id+id+(id)
Parsed successfully!
```