计算物理作业 1

杨远青 22300190015

2024 年 9 月 13 日

1 题目 1：五次幂丢番图方程

1.1 题目描述

Find all integer solutions to the **Diophantine equation** $a^5 + b^5 + c^5 + d^5 = e^5$ within the range $[0, 200]$.

1.2 程序描述

1.3 伪代码

的伪代码如下所示

Algorithm 1: Brute-force solution to the Diophantine equation

Input: N: Integer (the upper bound, $N = 200$)

Output: *solutions*: List of tuples (a, b, c, d, e); // where $0 \leq a \leq b \leq c \leq d < e \leq N$

```
for a ← 0 to N do
    for b ← a to N do
        for c ← b to N do
            for d ← c to N do
                for e ← d + 1 to N do
                    if a^5 + b^5 + c^5 + d^5 = e^5;   // Check if the tuple is a solution
                     then
                        solutions.append((a, b, c, d, e)) ;   // Store the solution tuple
                    end
                end
            end
        end
    end
end
return solutions;   // Return the list of solution tuples
```

Data: Input data

Result: Output result

```
for i = 1 to n do
    Process data;
    ; /* This is a comment using tcc                                    */
    Process more data;
    // Another comment using tcp
end
```

Algorithm 2: Mod-30 trick solution to the Diophantine equation

Input: N: 整数上限 $(N = 200)$

Output: 所有满足 $a^5 + b^5 + c^5 + d^5 = e^5$ 且 $0 \le a \le b \le c \le d < e \le N$ 的整数解 (a, b, c, d, e)

```
for a ← 0 to N do
    for b ← a to N do
        for c ← b to N do
            for d ← c to N do
                for e ← d + 1 to N do
                    if a^5 + b^5 + c^5 + d^5 = e^5 then
                        Result: (a, b, c, d, e)
                    end
                end
            end
        end
    end
end
```

1.4 输入输出实例

对于本程序，首先需要用户输入电路中六个电阻 $(r_s, r_a, r_x, r_1, r_2, r_3)$ 的数值，通过这些电阻值写出增广矩阵 $\boldsymbol{R}|\boldsymbol{v}$，将该增广矩阵带入高斯消去法中即可求得电流 $\boldsymbol{i}$，等效电阻 $r_e = v_0/i_1$。下列表格为在相应输入电阻下的运算结果