1) **Compute the number of typical operations of this code ?What is the complexity of this algo**

```
int a = 0;
for (i = 0; i < N; i++) {
   for (j = N; j > i; j--) {
      a = a + i + j;
   }
}
```

```
int a = 0;                              // 1
for (i = 0; i < N; i++) {               // 1 + 2N
        for (j = N; j > i; j--) {       // 1 + 2(N^2 – C) với C = 1+2+3….+ N
                                        // C = N(N+1)/2
      a = a + i + j;                    // 3(N^2 – C)
   }
}
```

⇨ The number of typical oper $= 5N^2 + 2N + 3 – 5C$

2) **Prove that T (n) = a0 + a1n + a2n2 + a3n3 is O(n3) using the formal definition of the Big-O notation**

$G(n) = a0 + a1n + a2n^2 + a3n^3$

Tồn tại một hằng số C1 và n0 để G1(n) = a0 + a1.n <= C1.n với n >= n0

⇨ T1(n) = O(G1) = n

Tương tự như vậy với $G2(n) = a2n^2$ => $O(G2) = n^2$; $G3(n) = a3n^3$ => $O(G3) = n^3$

Quy tắc cộng Big O thì => $O(G) = O(G1) + O(G2) + O(G3) = n^3$

3) **Determine dominants term and O in the following table**

Expression	Dominant term(s)	$O(\ldots)$
$5 + 0.001n^3 + 0.025n$	n3	n3
$500n + 100n^{1.5} + 50n \log_{10} n$	n1.5	n1.5
$0.3n + 5n^{1.5} + 2.5 \cdot n^{1.75}$	n1.75	n1.75
$n^2 \log_2 n + n(\log_2 n)^2$	n2.log2(n)	n2.log(n)
$n \log_3 n + n \log_2 n$	nlog2(n)	nlog(n)
$3 \log_8 n + \log_2 \log_2 \log_2 n$	log8(n)	log(n)
$100n + 0.01n^2$	n2	n2
$0.01n + 100n^2$	n2	n2
$2n + n^{0.5} + 0.5n^{1.25}$	n1.25	n1.25
$0.01n \log_2 n + n(\log_2 n)^2$	n(log2(n))2	n(log(n))2
$100n \log_3 n + n^3 + 100n$	n3	n3
$0.003 \log_4 n + \log_2 \log_2 n$	log4(n)	log(n)

4) Fill the following table

Statement	Is it TRUE or FALSE?	If it is FALSE then write the correct formula
Rule of sums: $O(f + g) = O(f) + O(g)$	False	O(f+g) = O(max(O(f), O(g))
Rule of products: $O(f \cdot g) = O(f) \cdot O(g)$	True	
Transitivity: if $g = O(f)$ and $h = O(f)$ then $g = O(h)$	False	if g =O(f) and f = O(h) then g = O(h)
$5n + 8n^2 + 100n^3 = O(n^4)$	False	O(n3)
$5n+8n^2+100n^3 = O(n^2 \log n)$	False	O(n3)