You will submit your solution to this assignment to the Curator System (as `HW2`). Your solution must be either a plain text file (e.g., NotePad) or a typed MS Word document; submissions in other formats will not be graded.

Partial credit will only be given if you show relevant work.

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1. [20 points] Apply the exact analysis rules from the course notes (Slide 7, T06.AlgorithmAnalysis.pdf) to determine a complexity function T(N) for the following algorithm. You must simplify your answer completely (no summation formulas, all terms combined as far as possible).

```
Limit = N;
Result = 1;

for (i = 1; i <= N; i++) {

   if ( i % 2 == 0 )
      Result = i * Result;
   else
      Result = Result + i * i;
}
```

2. [20 points] Apply the exact analysis rules from the course notes (Slide 7, T06.AlgorithmAnalysis.pdf) to determine a complexity function T(N) for the following algorithm. You must simplify your answer completely (no summation formulas, all terms combined as far as possible).

```
Limit = N;
Sum = 1;

for (i = 1; i <= N; i++) {

   for (j = 1; j <= i; j++) {

      Sum = Sum + i * j;
   }
}
```

3. [20 points] Apply the exact analysis rules from the course notes (Slide 7, T06.AlgorithmAnalysis.pdf) to determine a complexity function T(N) for the following algorithm. You must simplify your answer completely (no summation formulas, all terms combined as far as possible).

```
Limit = 1 << N;    // Limit == 2^N
Sum = 0;
X = 1;

for (i = 1; i <= N; i = 2 * i) {

   Sum = Sum + i * X;
   X++;
}
```

4. [15 points] State the simplest possible big-Θ equivalent for each given function. No justification is required.

a) $f(n) = 3n\log n + 17n^2 + 8\log n + 42n + 100$

b) $g(n) = 1000n + \log n$

c) $h(n) = 10 + 7n^{50} + 2^n$

5. [25 points] Use any applicable theorems from the course notes to prove the following two facts:

a) $f(n) = n^2 \log n + n \log^2 n$ is $\Theta\left(n^2 \log n\right)$

b) $f(n) = n^2 \log n + n \log^2 n$ is strictly $\Omega\left(n \log^2 n\right)$

Note: $\log^2 n = \left(\log n\right)^2$.