Q1 – [Asymptotic Relations - 1 point] For each of the following pairs of functions f (n) and g(n), determine the most appropriate symbol in the set {O, o, Θ, Ω, ω}. (lg n = log to the base 2 of n)

1.	$f(n) = 1005n^2 + 10n + 11$	$g(n) = n^3/1000$
2.	$f(n) = lg^7(n^7)$	$g(n) = (n^{1/2})^{1/2}$
3.	$f(n) = (n^2 - 1)(n^2 + 1)lgn$	$g(n) = n^4\ lgn^{1001}$
4.	$f(n) = 32^{lg\sqrt{(n)}}$ *(square root of n)*	$g(n) = n^3$

Q2 – [Step count analysis - 1 point] Analyze the following pseudocode and give a tight bound on the running
time as a function of n. You can assume that all individual instructions take O(1) time
Show your work.

```
l := 0; i := 1;

while i ≤ n {
      for j = 1 to i {
            l := l + 2 * n + 3 * j;
      }
      i = 2 * i
}
```

Q3 – [Logarithms – 1 point] Prove that $a^{\log_b x} = x^{\log_b a}$. Do not assume the statement to be true. Deduce your answer by applying logarithm principles.

Q4 – [Recurrence relations – 2 points] Please solve the following recurrences.

1. $T(n) = 4T(n/3) + n$
2. $T(n) = 3T(n/3) + n/2$
3. $T(n) = 4T(n/2) + n^{2.5}$
4. $T(n) = T(n/2) + T(n/4) + T(n/8) + 1$