Assignment One

Name:	
Student Number:	

Direction:

Please answer all the questions below and hand in your answers before the due day. All work, must be handed in **on time**.

Due day:

April. 12, 2021

Please hand it in by the class time.

Questions:

1. For each of the following functions, indicate how much the function's value will change if its argument is increased fourfold.

   a. $log_2 n$ b. $\sqrt{n}$ c. n d. n^2 e. n^3 f. 2^n

2. Prove (by using the definitions of the notations involved) or disprove (by giving a specific counterexample) the following assertions.

   a. If $t(n) \in O(g(n))$, then $g(n) \in \Omega(t(n))$.

   b. $\Theta(\alpha g(n)) = \Theta(g(n))$, where $\alpha > 0$.

   c. $\Theta(g(n)) = O(g(n)) \cap \Omega(g(n))$.

   d. For any two nonnegative functions $t(n)$ and $g(n)$ defined on the set of nonnegative integers, either $t(n) \in O(g(n))$, or $t(n) \in \Omega(g(n))$, or both.

3. Solve the following recurrence relations.

   a. $x(n) = 3x(n-1)$ for $n > 1, x(1) = 4$

   b. $x(n) = x(n-1) + n$ for $n > 0, x(0) = 0$

   c. $x(n) = x(n/2) + n$ for $n > 1, x(1) = 1$ (solve for $n = 2^k$)