DAA Assignment 2, Feb 3

1. Write Asymptotic notations for the following ($O, o, \Omega, \omega, \theta$)
   (a) $6n + 3$
   (b) $10^{1000}\frac{1}{n^2} + n^3 - 6n + 17$
   (c) $n^3 - 3^n + 100n^6$
   (d) $n^3 + (0.5^n) + 100n$
   (e) $n + sinn$
2. Prove that $10n - 6 \neq \theta(n^2)$
3. Prove that $n^2 + 5n - 6 \neq o(n^2)$
4. Prove that $n^k = o(c^n)$, for any fixed integer $k \geq 0$ and any fixed constant $c > 1$
5. Prove or disprove: O, Ω, θ notations are reflexive, symmetric and transitve.
6. Prove: If $f(n) = \theta(g(n))$, then $f(n) \neq o(g(n))$,
7. Solve assuming suitable values for base case:
   (a) $T(n) = 3T(\sqrt{n}) + 1$
   (b) $T(n) = 3T(n - 3) + n$
   (c) $T(n) = 5T(\frac{n}{2} + 6) + n^2$
   (d) $T(n) = \sqrt{(}T(n - 1)T(n - 2))$
8. Solve using recursion tree and Master's Theorem
   (a) $T(n) = 3T(\frac{n}{2}) + n \log n$
   (b) $T(n) = 3T(\frac{n}{2}) + 2^n$
   (c) $T(n) = 4T(\frac{n}{2}) + n^2$
   (d) $T(n) = 4T(\frac{n}{2}) + \frac{n^2}{2^n}$
   (e) $T(n^2) = 16T(\frac{n^2}{4}) + n^2 \log n$
9. Present tight asymptotic complexity (θ notation) for the following.
   (a) To list all permutations of a set of size 6.
   (b) To list all reflexive relations on a set of size 10.
   (c) To list all subsets of size $\log n$, given a set of size n^2, n is a variable.
   (d) To compute the determinant of a matrix of order n
   (e) To find the cofactor matrix of a matrix of order n
10. Read (i) Bubble sort (ii) Selection sort (iii) Insertion sort, and trace the algorithm for the following inputs
    a) -1,1,2,3
    b) 4,3,2,1
    c) -1,1,2,6,5,4