Assignment #1

(Assignment due: Oct. 02, 2024. Submitted to Ms. Rasagnya Kondam: kondam-r@webmail.uwinnipeg.ca)

1.(25) Please prove the following equalities and inequalities:

$10n \notin \Theta(n^2)$.

$100n = \Theta(n)$.

$2^{2n} \notin \Theta(2^n)$.

2.(25) Let $a \geq 1$ and $b > 1$ be constants, let $f(n)$ be a function, and
Let $T(n)$ be defined on nonnegative integers by the recurrence
$T(n) = aT(n/b) + f(n)$, where we can replace n/b by $\lfloor n/b \rfloor$ or $\lceil n/b \rceil$.

Prove that if $f(n) = \Theta(n^{\log_b a})$, then $T(n) = \Theta(n^{\log_b a} \lg n)$.

3.(25) Trace the computation process of quick-sorting algorithm over sequence:

2 6 5 4 3 1 7 10 8 9.

4(25) Show that the running time of BuildMaxHeap algorithm is bounded by $O(n)$.