KING SAUD UNIVERSITY

COLLEGE OF COMPUTER & INFORMATION SCIENCES
DEPT OF COMPUTER SCIENCE

CSC512 Computer Algorithms
First Semester 1427/1428 AH

Due:	Nov 20 at start of class
Instructor:	Dr. Aqil Azmi

Assignment #2

1. Show that for any constants $a \in \mathbb{R}$, $k \in \mathbb{Z}^+$ (positive integer), then
$$(n + a)^k = \Theta(n^k).$$

2. If $f(n) = n^{\log_2 m}$ and $g(n) = m^{\log_2 n}$, indicate which of these relations are true and prove your answers: $f(n) = O(g(n)), f(n) = \Omega(g(n))$, and $f(n) = \Theta(g(n))$.

3. Consider the following list of functions and arrange them in ascending (increasing) order of growth rate.
$f_1(n) = 10^n$
$f_2(n) = n^{1/3}$
$f_3(n) = n^n$
$f_4(n) = \log_2 n$
$f_5(n) = 2^{\sqrt{\log n}}$.

4. Show that
$$\sum_{k=1}^{n} 1/k = O(\log n).$$

5. Suppose that an algorithm A runs in worst-case time $f(n)$ and that algorithm B runs in worst-case time $g(n)$. Is A faster than B for all n greater than some n_0 if $g(n) = \Omega(f(n)\log n)$? Answer either *yes*, *no*, or *can't tell* and explain why.

Reading Assignment (Introduction to Algorithms, 2/e).

- The Rabin-Karp string matching algorithm (Section 32.2, pp. 911-5).
- Heapsort (Sections 6.1-6.4, pp. 127-37).