CS2223
HW#2

DUE: Monday, November 10

1. (3 points) Do **Problem 2.6** on pg. 75 of our text. Assume that the logarithm is to the base 10.

2. (12 points) The abstract data type *set* over the set of integers supports at least the operations *MakeNull* (to make a new empty *set*), *Insert* (to insert a new element into a *set*) and *Member* (to test if an element belongs to a *set*).
(*a*) Write and test some programs to implement *set* as an unordered array. Executing the sequence of operations:

MakeNull(A), *Insert*(1,A), *Insert*(5,A), *Insert*(1,A), *Insert*(4,A)

should cause *Member*(5,A) and *Member*(6,A) to return "true" and "false" respectively. Submit your code and a demonstration that it works.
(*b*) Using Θ-notation, what is the expected execution time of *Member*(x,A) if $x \notin A$ and $|A|=n$?
(c) For your implementation, what is the actual the expected execution time of *Member*(x,A) if $x \notin A$ and $|A|=n$? Assuming no memory limitations, how long would you expect it to execute *Member*(x,A) if $x \notin A$ and $|A|=1{,}000{,}000{,}000$?
(*d*) In our discussion in class of *InsertionSort*, we saw how the use of a sentinel made our program approximately twice as fast. Use a sentinel in your program for the previous part of this problem and determine how much faster it makes your *Member*.