CSE 2331 - Problem Set 4
Due beginning of lecture on October 15th

Problem numbers are from the third edition of "Introduction to algorithms". If unsure about which problem to solve, ask. Collaboration is permitted; looking for solutions from external sources (books, the web, etc.) is prohibited.

1. 6.4-1

2. (a) Suppose that we are storing a set of n keys into a hash table of size m. Show that if the keys are drawn from a universe U with $|U| > mn$, then U has a subset of size n consisting of keys that all hash to the same slot, so that the worst-case searching time for hashing with chaining is $\Omega(n)$.

   (b) Suppose we wish to search a linked list of length n, where each element contains a key k along with a hash value $h(k)$. Each key is a long character string. How might we take advantage of the hash values when searching the list for an element with a given key?

3. Demonstrate what happens when we insert the keys 25, 8, 9, 15, 20, 33, 12, 17, 10 into a hash table with collisions resolved by chaining. Let the table have 9 slots, and let the hash function be $h(k) = k \mod 9$.

4. Consider inserting the keys 20, 12, 1, 34, 25, 18, 17, 88, 59 into a hash table of length $m = 11$ using open addressing with the auxiliary hash function $h'(k) = k$. Illustrate the result of inserting these keys using linear probing (that is, the actual hash function is $h(k, i) = (h'(k) + i) \mod m$ and the sequence of probed slots is $h(k, 0), h(k, 1), h(k, 2), \ldots$).