CSE 326 DATA STRUCTURES
HOMEWORK 5

Due: **Wednesday, July 25, 2007** at the beginning of class.

1. Show the final table resulting from inserting 10, 15, 12, 3, 1, 13, 4, 17, and 8 into the following initially empty hash table implementations. Indicate if and when no more keys can be inserted into the table. Assume the table size is 11.
   (a) Separate chaining.
   (b) Linear probing.
   (c) Quadratic probing.
   (d) Double hashing, where the second hash function is $hash(x) = 5 - (x \bmod 5)$.
2. In this problem we see how to use hashing to do fast string search. Suppose we have a string $A = a_1 a_2 \ldots a_m$ that we would like to find the first occurrence of in a longer target string $T = t_1 t_2 \ldots t_n$. Assume that we use a large prime p for hashing strings and our hash function is $h(x) = x \bmod p$. The idea is to first compute $h(A)$ then compute $h(t_i \ldots t_{i+m-1})$ for $i = 1, 2, 3, \ldots$ until this value equals $h(A)$. The string $t_i \ldots t_{i+m-1}$ can then be checked to see if it equals A. If so, we're done, if not we have a false positive and we continue the search.
   (a) Show that $h(t_{i+1} \ldots t_{i+m})$ can be computed in constant time given $h(t_i \ldots t_{i+m-1})$.
   (b) Show that the time to do the search is $O(m + n)$ time plus the time to check false positives.
   (c) Compute the probability of a false positive as a function of p.
3. Weiss, problem 5.4, 5.5.
4. (extra credit) Weiss, problem 5.12