CSc 345: Analysis of Discrete Structures
Spring 18 (Lewis)

Week 11 Quiz

Solutions

Name: ___________________________ NetID (email): ____________________

Fill in your name and NetID.
Please do not open the quiz until I tell you to do so.

Directions: Answer the following questions to the best of your ability. When appropriate, we encourage you to show your work, to help us understand your thought process. Quizzes count toward your grade; please take them seriously.
1. Imagine that you have two data elements, and all you know are their hashes - not their actual key values. If the hashes are different, what can you conclude?

**Solution:** If the hashes are different, then the keys are definitely different as well!

If the hashes are the same, what can you conclude?

**Solution:** Not much. They **might** be the same - or they might be different.

2. What is the time cost of an insert operation on a hash table, if a collision doesn’t occur?

**Solution:** $O(1)$

Why do collisions hurt the performance of a hash table?

**Solution:** If you have a collision, then you will need to search for the correct place to insert/find/delete the element, which takes more than $O(1)$ time.

3. Using the linked list method, insert the following keys into a hash table with 7 slots:

$1 \ 10 \ 2 \ 4 \ 0 \ 3 \ 9 \ 7 \ 6$

Use the hash function

$hash(x) = 5x \mod \ 7$

(For simplicity of drawing the picture, add new elements at the end, not at the beginning, of each list.)

**Solution:**

```
[ 0] -> 0 -> 7
[ 1] -> 10 -> 3
[ 2] -> 6
[ 4]
[ 5] -> 1
[ 6] -> 4
```