# CS Homework 5 Problem 3

Jacob Johns

October 26 2018

**Question 3** [label=]
(30 points) Using a hash table $T$ of size $m = 11$ (i.e., $T[0 \cdot \cdot \cdot 10]$) with hash function $hash(x) = x\%m$, show the hash table that results after the following keys are inserted in the given order: 26 42 5 44 92 59 40 36 12.
For each of the following probing methods, show the resulting hash table.

a. Linear probing, i.e., $h_i(x) = (hash(x) + i)\%m$, for $i = 0, 1, 2, \ldots$

| Index k | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Value H[k] | 44 | 12 | | 36 | 26 | 5 | 92 | 59 | 40 | 42 | |

b. Quadratic probing, i.e., $h_i(x) = (hash(x) + i^2)\%m$, for $i = 0, 1, 2, \ldots$

| Index i | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Value H[i] | 44 | 59 | 12 | 36 | 26 | 5 | 92 | 40 | | 42 | |

c. Double hashing using the secondary hash function $hash2(x) = x\%9 + 1$, i.e., $h_i(x) = (hash(x) + i \cdot hash_2(x))\%m$, for $i = 0, 1, 2, \ldots$ Note that this secondary hash function does not follow the style we discussed in class, but theoretically we can pick any function as the secondary hash function.

| Index i | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Value H[i] | 44 | 12 | | 36 | 26 | 5 | 40 | 92 | | 42 | 59 |