2) (5 pts) ALG (Hash Tables)

a) (3 pts) Consider a hash table that uses the linear probing technique with the following hash function f(x) = (5x+4)%10. (The hash table is of size 10.) If we insert the values 3, 9, 2, 1, 10, and 6 into the table, in that order, show where these values would end up in the table.

Index	0	1	2	3	4	5	6	7	8	9
Value	**9**	**1**			**2**	**10**	**6**			**3**

b) (2 pts) Why is the hash function defined in part (a) a particularly bad hash function?

No matter what value is inputted into the function, there are only two possible output values: 4 and 9. We can see this because every expression of the form 5x + 4, where x is an integer ends in either 4 or 9 as the units/ones digit. This is precisely the value returned by the hash function. A good hash function provides an equal probability of each possible output value. In this case, the probability of the output equaling 0, 1, 2, 3, 5, 6, 7 or 8 is 0, thus we don't come close to providing equal probability of each of the 10 possible output values.

Grading: **½ for each value in the hash table, round down to an integer.**
Give full credit if answer indicates awareness that some hash values are impossible to achieve. Give partial as necessary.