1 Question 1

For any network with m we can always set p = 0. From there we can build a counter example where q = 2^{m-1}. If we put no nodes between p and q (q-p = 0) every entry in p's lookup table will be q. This way we guarantee that q will be the next hop from p. If we set k to some value greater than q, k-p=1. So any value of m can generate a network with p = 0, q = 2^{m-1}, and k = $2^m - 1$. This will always result in q-p=0 and k-p=1 which is a counter example to the generic case. Therefore this holds for all values of m.

Another counter example can if you always have p = 0 , q = 2, no node between p and q, and k = 3 it doesn't matter how many nodes you add to this network or how you shift the value of m the equations of q-p=0 and k-p=1 will still hold which violates our claim.

2 Question 2

2.1 a)

NO IDEA WHAT TO DO

2.2 b)

When we add a node n into this network only one table will need to be updated. The node right before n will have to update its table to now have n as its successor. Everyone else will remain the same.

3 Question 3

3.1 a)

We know that the expected number of hops for a network is $O(\log n)$. We know that the finger table must have enough entries to accommodate n so $n \leq 2^{m-1}$. So we can sub in this value for n and still maintain this worse case relation, so $O(\log 2^{m-1})$ if we simplify this we get that number of expected hops is $O(m)$. Based on this we can assume that there exists some case where the number of hops is less than linear.

3.2 b)

NO IDEA WHAT TO DO