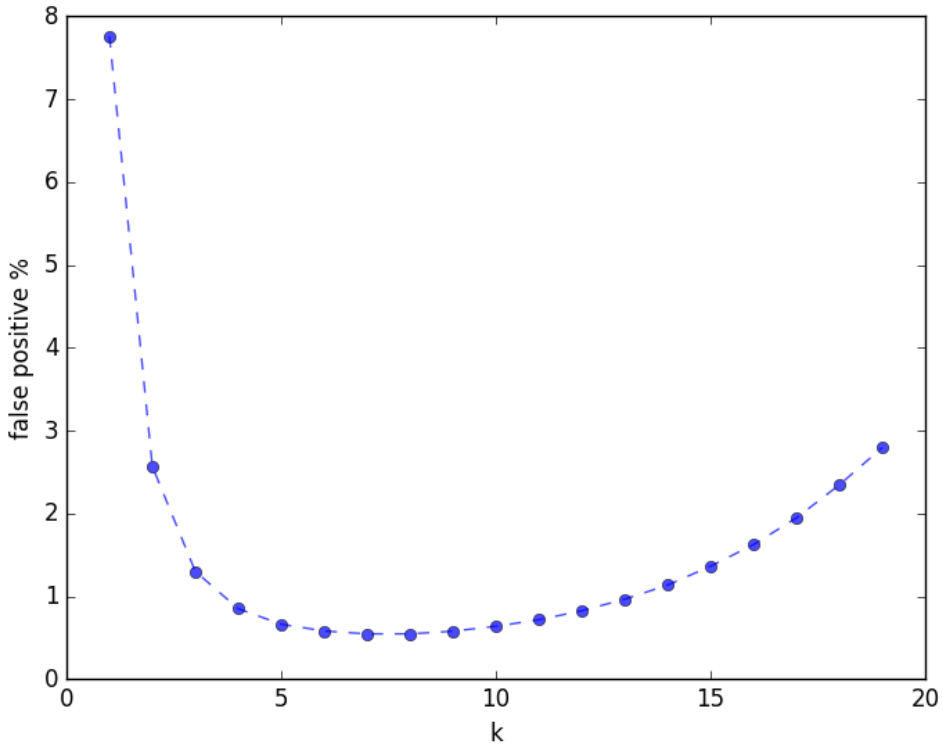
The hw5_1.py and hw5_2.py code were attached.

For problem 2:



Above plot shows the variation of the FP rate with the number of hash functions.

We can see the optimal k should be located at round 7.

The exact number should be n/m*ln2

For problem 3:

The final result is 67108864 distinctive Qs.

There are 210999825 Qs in total.