2) (10 pts) ANL (Algorithm Analysis)

(a) (5 pts) An algorithm for searching for a housing contract in a database of n records takes $O(\lg n)$ time. When $n = 2^{20}$, one million searches can be performed in one fifth of a second. If we increase the database to size $n = 2^{25}$, how long will 500,000 searches take?

(b) (5 pts) A shortest distance algorithm on an $n \times m$ street grid runs in $O(nm)$ time. If the algorithm takes 2 seconds to run on a 4000×3000 sized grid, how long will it take on a grid of size 2000×18000 sized grid?