2) (10 pts) ANL (Algorithm Analysis)

(a) (5 pts) A matrix factorization algorithm that is run on a input matrix of size n x n, runs in $O(n^3)$ time. If the algorithm takes 54 seconds to run for an input of size 3000 x 3000, how long will it take to run on an input of size 1000 x 1000?

(b) (5 pts) A string algorithm with inputs of lengths n and m runs in $O(n^2m)$ time. If the algorithm takes 2 seconds to run on an input with $n = 1000$ and $m = 500$, how long will the algorithm take to execute on an input with $n = 250$ and $m = 1000$?