QUESTION 1: Polynomials & Exponentials

Today, your computer can do T steps in a week. According to Moore's law, next year, your computer will be able to do 2T steps in a week. How does doubling T change the n that can be computed in a week?

a) If $T = n^2$, what does doubling T correspond to in terms of n? In other words, by what arithmetic factor does n change when T doubles?

b) If $T = 2^n$, what does doubling T correspond to in terms of n? In other words, by what arithmetic factor does n change when T doubles?

Important! Your answer should include an algebraic solution as well as the reasoning/logical steps - either in words or equations - by which you arrived at your answer. The latter will form a part of the exam grade.

QUESTION 2: Divide & Conquer

For the Towers of Hanoi puzzle, there is a function $f(n)$ that computes the total number of moves needed to move n disks. For $f(0) = 0$, but for n greater than 0, $f(n) = 2f(n-1)+1$. Additionally:

n	0	1	2	3
$f(n)$	0	1	3	7

a) What is the function that allows the equation to be true?

b) What is $f(n)$ for n = 64?

Important! Your answer should include both an algebraic solution (the identity of function f) as well as a numeric solution, solving for n=64.

*The questions correspond to the **Polynomials & Exponentials** (QUESTION 1) and **Divide & Conquer** (QUESTION 2) Quizzes, where you can find more information.*