CSC236 Tutorial 6

1. Let $T(n)$ denote the worst-case running time of the algorithm below on inputs of size n.

```
# A is a list.
    def fun(A):
1.      if len(A) < 2:
2.          return 1
3.      else:
4.          m = len(A)//2 # Integer division
5.          return fun(A[0..(m − 1)]) ∗ fun(A[m..(len(A) − 1)])
```

   (a) Write a recurrence relation satisfied by T. You may assume that $len(A)$ is a power of 2. Make sure to define n precisely (as a function of the algorithm's parameters) and justify that your recurrence is correct (by referring to the algorithm to describe how you obtained each term in your answer).

   (b) Give an asymptotic upper-bound for the worst-case running time of the algorithm.

2. Consider the following function

$$f(n) = \begin{cases} 4, & n = 1 \\ 9f(\frac{n}{3}) + n^2 - 3, & n \geq 2 \end{cases}$$

   Find a closed-form expression for f. You may assume that n is a power of 3.
   You don't need to prove the correctness of the closed-form expression you obtained.