Model Checking Homework 11

We have discussed two algorithms for computing a Büchi automaton equivalent to a given LTL specification in class: the naive one (section 7.9 in the book) and the efficient one (section 7.10 in the book).

Task 9a. [**7 points**] Consider the LTL formula

$$\varphi_n = \underbrace{X \ldots X}_{n \text{ times}} p,$$

that states *for all paths, p is true in the n-th position of the run trace.*
Compute the number of states (parametrized by n) in the automaton obtained from the naive algorithm (**2 points)** and in the one obtained from the efficient algorithm (**5 points**).

Task 9b [**3 points**] For the formula $\psi = FXXp$, compute the equivalent Büchi automaton using the more efficient algorithm.

Task 9c (Bonus) [**2 points**] Is it possible to produce an automaton equivalent to ψ with less states than the automaton obtained in Task 9b. If it is, give an example, if it is not, justify why.