

HW 8 CMSC 452. Morally Due April 3

1. (5 points) What is your name? Write it clearly. Staple the HW.
2. (0 points, but you may want to use this on some of the problems.)
 - (a) Look at <https://planetcalc.com/3311/> which is a website that has a calculator that computes mod inverses; calculate a few things to get a sense of what it can do.
 - (b) Use Google to find things like $100 \pmod{7}$. Just type in '100 mod 7'
3. (25 points) Show that:
 - (a) There DOES NOT EXIST $c, d \in \mathbf{N}$ such that $719 = 19c + 41d$.
 - (b) For every $n \geq 720$ there DOES EXIST $c, d \in \mathbf{N}$ such that $n = 19c + 41d$. (HINT: Factor the following numbers: 246, 247, 532, 533)
4. (25 points) Find a set of primes whose product is ≥ 720 and whose sum is ≤ 30 .
5. (25 points) Use the answers Questions 4 and 5 to create a small NFA for $L = \{a^i : i \neq 719\}$. How many states does it have?
6. (25 points) (HINT: Use the results from prior problems for this problem. Do not start from scratch.) Let $L_n = \{a^i : i \neq n\}$
 - (a) Create a small NFA for L_{720} . How many states does it have?
 - (b) For $2 \leq x \leq 10$ create a small NFA for L_{719+x} . How many states does it have (as a function on x). If you draw it you may use ...
 - (c) (Think about, no points) For large x the technique you used in the last part would not work. Why is that and when does it happen?