

Theory of Computation

CS 378, Fall 2022

Small Assignment 2

Due **BY THE BEGINNING OF CLASS** Tuesday, September 20

- Standard file naming and HW submission conventions apply: Please submit your type-written answers in a PDF file named

`CS378_SA2_<userid>.pdf`

where `<userid>` is replaced by your Colby userid—for example, my file would be called `CS378_SA2_eaaron.pdf`. Please use your full userid, including your class year. Place the properly named file in your **Private** directory in your CS378 filespace on **filer**.

- As usual for small assignments in CS378 this semester, this is due by the beginning of the next class meeting, and it will be marked on a $\checkmark + / \checkmark / \checkmark - / 0$ scale.
- *A general note for CS378:* As always, please present answers cleanly and **explain them clearly and thoroughly**, giving all details needed to make your answers easy to understand; typed-up (rather than handwritten) answers are required, and using $\text{\LaTeX}$ to typeset your answers is appreciated. (Feel free to talk with your Prof. about using $\text{\LaTeX}$!) Graders may not award full credit to incomplete or illegible solutions. Clear communication *is* the point, on every assignment.

In general in CS378, unless explicitly specified otherwise, answers should be accompanied by explanations. Answers without explanations may not receive full credit. Please feel free to ask me any questions about explanations that might come up!

Exercises

1. The *cardinality* of a finite set A is the number of elements in A . For example, the cardinality of $\{b, l, a, h\}$ is 4 and the cardinality of $\{b, \{l, a, h\}\}$ is 2 (do you see why?). The cardinality of a set A is denoted $|A|$.

Use induction on the cardinality of A to show that for all sets A of finite cardinality, $|\mathcal{P}(A)| = 2^{|A|}$. (Recall that $\mathcal{P}(A)$ denotes the power set of A .) As always in inductive proofs for CS378, clearly state the claim to be proved, prove the relevant base case, state the relevant inductive hypothesis, and prove the relevant inductive case.