

Scientific Writing: Problem Set 2

October 16, 2026

You are strongly encouraged to choose task 1 (and 2 other tasks).

Task 1 (paraphrase of “Mathematical Writing”). Below is a mathematically (almost) correct, but stylistically bad, proof. Please reformulate it, so that it is readable. Also change the notation to more standard one.

Let N denote the set of nonnegative integers, N^n denote the set of n -tuples of nonnegative integers, and

$$A_n = \{(a_1, \dots, a_n) \in N^n \mid a_1 \geq \dots \geq a_n\}.$$

For $C, P \subset N^n$ the $L(C, P)$ is defined as

$$\{c + p_1 + \dots + p_m \mid c \in C, m \geq 0, \text{ and } p_j \in P \text{ for } 1 \leq j \leq m\}.$$

We prove that $L(C, P) \subseteq A_n$ implies $C, P \subseteq A_n$:

$$\begin{aligned} L(C, P) &\subset A_n \\ C \subset L &\Rightarrow C \subset A_n \\ \text{Spse } p \in P, p \notin A_n &\Rightarrow p_i < p_j \text{ for } i < j \\ c + p &\in L \subset A_n \\ \therefore c_i + p_i &\geq c_j + p_j \text{ but } c_i \geq c_j \geq 0, p_j \geq p_i \\ \therefore (c_i - c_j) &\geq (p_j - p_i) \\ \text{but } \exists \text{ a constant } k &\ni c + kp \notin A_n \\ \text{let } k = (c_i - c_j) + 1 &\quad c + kp \in L \subset A_n \\ \therefore c_i + kp_i &\geq c_j + kp_j \Rightarrow (c_i - c_j) \geq k(p_j - p_i) \\ \Rightarrow k - 1 &\geq k \cdot m \quad k, m \geq 1 \quad \text{Contradiction} \\ \therefore p &\in A_n \\ \therefore L(C, P) &\subset A_n \Rightarrow C, P \subset A_n, \text{ and the claim is true.} \end{aligned}$$

Task 2 (From “A Primer of Mathematical Writing”). List problems with the following statements, rewrite them.

- If g is positive, f is continuous, the domain of f is open, and we further invoke Lemma 2.3.6, then the set of points at which $f \cdot g$ is differentiable is a set of the second category, provided that the space of definition of f is metrizable and separable.
- All continuous functions have a maximum.

- Task 3.**
1. You are writing a paper, which will include a graph, a sequence of its subgraphs and their vertex sets and edge sets. Propose notation for all these objects so that their relationships are visible from the notation.
 2. Design a notation for the following objects: a collection of strings (may have repetitions), a string from this set, its length, a position in the string, and the character at that position. Devise a notation for a prefix and a suffix relation. Since it is transitive, it would be good that your notation allows that.
 3. Consider a notation, in which v' denotes (some) prefix of v and v'' (some) suffix of v . Explain, why this is not a good idea.

Task 4. Take a couple of leading pages of a thesis and identify three typographical choices that distract from reading. For each one, propose a correction.

Luckily, in contrast to Poland, in many countries theses repositories are available online. Say <https://is.muni.cz/thesis/?lang=en>

Task 5. Take some old paper or textbook (the older the better). For instance at <https://dl.acm.org/loi/jacm>, which were top-notch at the time, or <https://www.sciencedirect.com/journal/theoretical-computer-science/issues?page=3>.

You can look at math papers <https://pubs.ams.org/TRAN?active=all>, but those might be harder to comprehend even at some basic level.

Look at the use of mathematical symbols. What do you think is good, what is bad? Propose improvements for bad. You are not required to understand the arguments.

Task 6. What measures of „goodness” of a sorting algorithm you can think of? Think of different scenarios, data structures.

For simplicity, consider algorithms using comparisons only. The examples to have in mind: quick-sort and mergesort.