

MATHEMATICS 300 — FALL 2018

Introduction to Mathematical Reasoning

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NOTES ON HOW TO WRITE YOUR HOMEWORK

1 Write clearly in complete English sentences

You should write so that you can be easily understood by a properly trained English-speaking individual. In particular, this means that you must

- Use *complete English sentences*, that make clearly identifiable *statements* with a *clear meaning* that can be understood by anyone reading what you wrote. For example:
 - If you tell me that “she is very smart,” but you haven’t told me who “she” is, then I don’t know who you are talking about, so you haven’t made a statement with a clear meaning.
 - If you write “ $x > 0$,” but you haven’t told me who “ x ” is, then I don’t know what you are talking about, so you haven’t made a statement.
 - If I ask you to state Pythagoras’ theorem and your answer only says “ $a^2 + b^2 = c^2$,” then nobody will know what you are talking about ¹, because you have not said what “ a ,” “ b ,” and “ c ” are supposed to be.²
- Avoid exaggerated or incorrect use of cryptic mathematical notation.

¹Of course, your teacher will know what you are trying to say, and anybody who already knows the statement of Pythagoras’ theorem will know. But when you are asked to state a theorem or a definition **you should write it as if you were talking to somebody who does not know yet what the theorem or the definition say.**

²Here is a correct statement of Pythagoras’ theorem: *Let c be the length of the hypotenuse of a right triangle, and let a , b be the lengths of the other two sides. Then $a^2 + b^2 = c^2$.*

- Explain what you are doing. For example,
 - do **not** write:
 p^2 is even. p is even.
 - write, instead, the following:
 p^2 is even. Therefore p is even, because if p was odd then p^2 would be odd, since the product of two odd integers is odd.
- Make sure that letter “variables” are used correctly, that is that either: (i) it has been said before what these letters stand for, or (ii) they are “closed variables” (or “dummy variables,” or “bound variables”) in the sense that will be discussed in detail in class, and will also be explained later in these notes.

For example,

- you must not write:
 $r = \sqrt{2}$. $r = \frac{m}{n}$. m and n are integers, $n \neq 0$.
- write, instead, the following:
 Let $r = \sqrt{2}$. Assume that r is rational. Then we may pick integers, m, n such that $n \neq 0$ and $r = \frac{m}{n}$.
- Provide proper connectives between equations as well as between ideas.

For example,

- you must not write:
 $(a - b)^2 \geq 0$. $a^2 + b^2 - 2ab \geq 0$. $a^2 + b^2 \geq 2ab$. $ab \leq \frac{a^2 + b^2}{2}$.
- write, instead, the following:
 Since the square of every real number is nonnegative, we have

$$(a - b)^2 \geq 0.$$

Therefore

$$a^2 + b^2 - 2ab \geq 0.$$

Hence

$$a^2 + b^2 \geq 2ab.$$

So

$$ab \leq \frac{a^2 + b^2}{2}.$$

- Make sure that all the rules of English grammar (including those of spelling and punctuation) are strictly obeyed.
- Try to say things correctly, following all the rules, but *in your own words*. Please *no rote learning*. If you have to memorize a definition or a statement, then that is not a good sign, because it indicates lack of understanding.
- Please proofread carefully what you hand in. Ideally, you should read and reread and revise almost any formal communication. **Neatness and clarity count**, as you well know if you've tried to read any complicated document.
- *Do not assume that the people reading your paper can read your mind. Do assume that they are intelligent, but also assume that they are busy, and cannot and will not spend an excessive amount of time puzzling out your meaning. Communication is difficult, and written technical communication is close to an art.*

Effective written exposition will be worth at least 50% of your grade. Conversely, bad or unclear exposition may be penalized as much as 50% of the grade or even more.

- The best reference known to me on effective writing is *The Elements of Style* by Strunk and White, a very thin paperback published by Macmillan. It isn't expensive, and it is easy to read. I recommend it.

2 Your written work

You should pay attention to presentation, especially for the homework:

- A nicely typed homework (e.g., using a word processor) is preferable to handwritten work. Handwritten work is acceptable too, but in that case:

- If you have to cross out lots of words, then you should rewrite the whole thing anew, **cleanly and neatly**. If you are not willing to spend some of your time doing this; if what you hand in shows that you were in a hurry and that you did not make the effort to write things neatly and properly, then there is no reason for the instructor or the grader to spend any of our time reading what you wrote, and we will not do it.
- Use a pen. **Never use a pencil.**
- Use ink of any color other than red (for example, black, blue, or green), but DO NOT USE RED. (Reason: The use of red is reserved for the instructor's and grader's comments.)
- If you tear off the sheets from a spiral notebook, please make sure before you hand them in that there are none of those ugly hanging shreds of paper at the margins. Use scissors, or a cutter, if necessary.
- Make sure that **your name appears on every sheet of paper you hand in**, and that if you are handing in more than one sheet then the sheets are **stapled** and the pages are **numbered**.

If you hand in a homework assignment that has at least one of the following flaws:

- it is written carelessly or in a hurry,
- it has lots of words crossed out,
- it has unreadable handwriting,
- it has pages that are unstapled or unnumbered or fail to show your name,
- it has shreds of paper at the margins,
- it is written using pencil rather than a pen,
- it is written in red,

then the assignment will be marked “unacceptable” and returned unread.