

Some Guidelines for Writing Up Homework Solutions

Most likely, the math you will be presenting to your instructor will be in the form of a written-up solution set for homework you were assigned. Below are some thoughts on what this bundle of papers should look like. But first, here are some reasons why you should keep reading:

There is a larger picture here. Developing a habit of producing clear, clean, readable math is an invaluable skill that carries over to many other situations in life. The best check that you've really solved any problem that required a coherent, rational, and logical approach is to explain the solution to someone (verbally or in writing). Until you are able to do this in a neat and concise manner, allowing the reader or the listener to focus on the content rather than on deciphering your presentation, the full grasp of the solution will be out of your reach. Math turns out to be the best discipline for practicing and honing this skill.

There is always that grade too. Professors don't have much tolerance for unreadable homework, so why waste precious points on handwriting, skipping steps, not checking your work, failing to use connecting phrases, and other easily avoided mathematical offenses? And besides, a good write-up will put you on a professor's good side in no time, even if your math is flawed, whereas perfect math and lousy exposition never will. Neatness and clarity show that you care, work hard, and, most importantly, have respect for the course, the subject matter, and the instructor.

Think about yourself. Someday, you will probably want to go back to the homework you wrote a while ago and understand it. College finals are comprehensive, which means that you'll need to remind yourself of the work you did three months earlier. Even worse, your major might require you to take a math course whose content you might not use until a couple of years later. So when you write the homework solutions, keep in mind that you might need all the details, written legibly, at some point down the road.

Here are some specific suggestions:

1. Keep in mind that what makes sense to you doesn't necessarily make sense to others. The ability to do this at all times is at the very essence of what distinguishes the exceptional speakers and writers among us. They are the ones who always consider the audience, the ones who are able to step out of their own minds and into those of their listeners and readers. The skill of asking and answering the question "Would this make sense to someone else?" is acquired over a long time and after lots of hard work.

The first step is to understand that communication, after all, is simply a set of loose rules of logic, reasoning, and language. The problem is that there are too many of them, no one knows them all, and no two people operate according to the same subset of these rules. Effective communication is thus to a large extent the ability to either recognize exactly what set of rules a certain situation requires or to draw on as many rules as possible all the time, thus protecting yourself from appearing incoherent. This is not easy, but math is a good place to start practicing because no other discipline relies more on following relatively few, yet very strict, rules of logic and reasoning.

(Almost all the guidelines below actually fall under the umbrella of this one. You might want to think about that.)

2. Do not turn in the first draft. As a rule, first drafts are sloppy and disorganized. That's why they're called first drafts, implying that there is something called a second draft. Amazingly, math homework rarely lives to see the second draft, but rather remains that initial incomprehensible brain goop all the way to the instructor's desk. An English paper, on the other hand, goes through several drafts before being typed, spellchecked, printed, and stapled. This makes no sense at all. And although sloppiness of the first draft of a math homework is a problem, the greater danger is that it might be filled with mistakes, often as simple as a forgotten minus sign or parenthesis, but sometimes showing a serious conceptual error. Proofreading and rewriting your work is the surest way to avoid such mistakes.

3. Write down all the important steps. If you do, you will always get partial credit for problems on your homework, even if the final answer is wrong, because the process of arriving at a solution is sometimes as important as the solution itself. Consequently, you might get no credit, even if your answer is right, if you don't show the work. On the other hand, this is the guideline that you could benefit from the most: If the answer is incorrect, but you supply all the steps, the person grading the homework can easily tell where you messed up and then more likely be generous with partial credit (it's all about the ease in grading). Don't take this advice too literally, though. We do not want to see every addition and multiplication you perform written up, so if you're not sure what counts as an important step (granted, this can be a tricky issue), seek feedback from your instructor or grader (especially since the criteria for "basic math" that you can leave out vary from person to person) and in a few weeks you'll get the hang of what's important to include in your write-up and what's not.

4. Use words. This is a big one. *It's OK to use words in math.* Actually, it's *necessary* to use words in math. A page of equations does not look impressive to a mathematician. On the contrary, a mathematician *hates* pages of equations, because he or she knows that it will be impossible to read them without the logical connectors that only the words can provide. You don't have to write essays explaining every step you make, but little pointers like "now plug in...", "now solve for...", "from the graph we see that...", "because...", "and the answer is therefore..." make a world of difference. It will only take you a minute to incorporate a few words into your write-up and it will save the person grading your homework a lot of time and aggravation (and as aggravation increases, points decrease).

5. Practice neatness.

(a) Write legibly. Ideally, the rule for bad handwriting should be that it is not penalized, because some people just can't help it (I am one of them). Unfortunately for you, however, what generally happens in practice is that the rule quickly becomes "If I can't read it, it's wrong".

(b) Leave some space between the lines and in the margins. The idea of homework, contrary to popular belief, is not to attach a number to your mathematical performance, but to help you absorb the material as painlessly as possible. The instructor's feedback on your progress is one of the most important parts of this interaction. A very simple but often overlooked technicality on this subject is that, well, you won't get any feedback if there's no room to write it anywhere.

(c) Staple the homework. Loose pages get shuffled and lost easily, and the points disappear with them.

(d) Mark what you're doing clearly. Label the problem, as well as the section and chapter it came from. Restate the question if it's not too long.

(e) Box in the answer. Even though you will get partial credit for incomplete work, getting to the right answer is still important. So make it look important.

(f) Put yours and your instructor's name in some visible place on the top page. Seems obvious, but you'd be surprised how many people forget to do it.