

Some thoughts and expectations on homework

John R. Schmitt

September 11, 2023

I'd like to share with you some of my thoughts and expectations on homework for this class. I do this so that there might be a better outcome for you as a result of knowing and abiding by these thoughts and expectations. These thoughts and expectations are the result of my 20+ years of being a mathematics student, teacher and scholar. This is an attempt at writing them down in some coherent fashion – I expect that I will continually revise this document (and you will help me).

First, there is no replacement for time spent working on problems. This is how one learns mathematics best. Lectures and reading are informative, important, and not to be missed, but they are secondary to working on problems. Further, it's impossible to say how much time is required - it depends upon the problem, your knowledge and creativity, your energy levels and ability to concentrate, and other things as well. There is no better preparation for an exam than working on problems and writing out solutions.

Next, mathematics is often a team sport. That is, I have found that working with others can be a successful way of solving problems. In fact, at this point, all of my mathematical publications are the result of collaborating with others. So, I would encourage you to work with others whenever possible. I have often found that one person is able to advance on a problem and, in turn, the other makes a subsequent advance. The opportunity to explain an idea to a companion cements that idea in your own mind and perhaps creates a more general idea. The opportunity to listen to someone with a good idea is like gold; it develops humility, as well. (Good friendships are often formed simultaneously – this is a fringe benefit.) When collaborating with others, please record the name(s) of those with whom you worked on the homework that you submit.

Homework is never “busy work”. That is, there is always some goal to each assignment, whether you realize it or not. I don't wish to occupy your time, I wish to occupy your mind and improve it. Please help me realize this. Find out what the goal is! Is it to understand some new theorem or proof technique? Is it to arouse curiosity? Perhaps it prepares you to receive some new idea too large to grasp all at once. Having an understanding of what you are doing and *why* you are doing it enables you to be motivated to do the work you've set for yourself.

There is a distinction between solving a problem and writing down its solution. The latter is as important as the former. Please try to do both well. In regards to the latter,

written solutions should be produced on your own; this is to gain ownership of the ideas present in the solution as well as to practice the art of writing. There is little better than reading a well-written, elegant solution to a challenging problem. On the other hand, reading garbage is painful. One becomes powerful when one is able to communicate effectively. So, introduce and define notation. Use notation consistently, this includes equal signs, limit signs and more. **Write sentences**, not just computations! Explain to the reader why you performed some computation and why it's valid. A well drawn figure can often be useful to illustrate a definition or idea. When writing proofs, it is often necessary to revise.

Your honesty is required. Why? I think I could write several pages answering this, but I'll let you answer it yourself. Please realize I will set you some problems that are very challenging. This can lead to frustration. Another possible source of frustration is the blood-bath of red ink that I may spill on your submitted written work. I do these things not to aggravate you, but to encourage deep thinking and promote good writing. Incorporate the suggestions you get from me in future work – it surprises me when students don't. In the past, I have found that students do foolish things when they are frustrated or overly-concerned with G.P.A., not with learning. These include copying on homework and exams, as well as copying solutions found via the internet or an illegitimately obtained copy of the solutions manual. I find such behavior disheartening and it is a violation of the College's Honor Code. In the past such violations have resulted in College discipline and failure for the course. The homework portion of your grade is considered as ONE assignment.

More recently, questions about the use of generative artificial intelligence have arisen. How do we incorporate such a powerful tool or do we shun it at this point? I don't know. My thoughts will develop as I learn about its capacities and how people use it. For now, it won't be used on exams, so I'd advise against its use on problem sets.

There are many resources available to you as a Middlebury College student to help with your homework. Chief among them is me. No, I won't do your homework for you, but I do give suggestions and hints, sometimes. Visit me in my office to discuss mathematics and learning. Schedule an appointment if my office hours don't work for you. Other resources include the Calculus Help Sessions and the Center for Teaching, Learning and Research (located in the Davis Family Library).

More thoughts to come later. Peace.