

How to Do Homework – and WHY!

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GENERAL NOTES

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YOUR NAME _____

INTRODUCTION

*Practice makes perfect*¹ is an old, tried-and-true saying. However, in a math class at the college or university level, there is not much time during the class period for you, the student, to practice math. The number of required topics and the essentially lecture-type atmosphere do not leave time for in-class practice. Thus math must be practiced outside the classroom. Now, I'll try set aside some time each class period to show you how to work homework problems you're "stuck" on. But in reality this work does not constitute "practice" for you; it is really just practice for me. And, hopefully, I don't need too much practice.

Now, what does it mean *to practice math*? I suggest that at the college level it means to actually work problems. And what does it mean to work problems?

I believe that there are two types of problems to be worked – ***routine problems*** and ***learning problems***. And, consequently, there are two approaches to be used in working problems. For each type problem there is a correct approach to be used in working the problem.

For the ***routine problem*** the correct approach is to work fast, do as much mentally as possible, and “master the *moves*.” It's like shooting free-throws in basketball – you are supposed to make the free-throw; you are supposed to get the problem right. And at the end of every basketball practice you have to shoot 10 in a row before you can leave the court. Repetition! That's the name of this game! If you don't do the reps in practice (homework), then you'll probably miss the shot (problem) in the game (test). So – when you are doing the homework you must recognize which problems are the routine problems and practice them accordingly. In my own case, sometimes I'll do *the same problem over-and-over* just to make sure that I can get it right.

On a more mundane level, *to practice math* is *to simplify expressions, to solve equations, to calculate, and to graph*.

What about ***learning problems***? These problems are meant to *teach me*. They are meant for me to *study*. I must ponder them and figure out what I'm supposed to *learn* from them – and *learn it*. I do not try to do these problems fast. I do not try to do these problems mindlessly. I think a lot. I write a lot. I make notes to myself. I use the techniques of ***Polya***². What does it mean for me to study problems? It means – to read problems carefully, to decide which mathematical *tools*³ to use, to properly use those mathematical tools⁴, to analyze the results, to interpret those results in a written style which is understandable even to an average, educated person.

And what do we call both these types of practice? We call them ***homework***. This is the bottom line – you've got to do homework to get good at math. And, evidently, your chosen career requires both analytical thinking and computational proficiency. Thus, you do need to “get good at math.”

So let's agree that homework is necessary. Now it's going to be part of my job this semester to convince you that "*Homework is a necessary evil*." is an incorrect statement. I must try to show you that homework is *necessary*, but not *evil*, in fact, I hope to show you that homework can be, well, . . . *fun*. Now, don't laugh! And really, if you do not enjoy the solving of problems, both mathematical and logical, then, I suggest, you will not be happy in a career involving mathematical reasoning and/or scientific inquiry. But I guess we'll see

¹ Actually, as a student pointed-out to me years ago *Perfect practice makes perfect*.

² [Pólya, George](#) (1945). *How to Solve It*. Princeton University Press. [ISBN 0-691-08097-6](#).

³ In this context, the word "tool" means a formula or equation.

⁴ Here, "use those tools" means solve the equations.

about that later.

In logical terms we say that doing homework is a *necessary condition* for success in this course. However, it is not a *sufficient condition* for success. That is to say . . .

If you are successful in this course, then it follows that you did your homework. (True).

As opposed to

If you do your homework, then you will be successful in this course. (False).

We'll talk more about these two sentences in class!

For now, let's get into how I want you to do your homework.

SPECIFICS

There are three (3) types of homework associated with this course:

- ▶ **Notebook Homework,**
- ▶ **Turn-In Homework (including PODs)⁵, and**
- ▶ **Computer-Based Homework (Either MyMathLab (MML) or WebAssign (WA)).**

You are responsible for all three types of homework. However, your treatment of the different types of homework will be very different.

I'll assign all three types of homework. For each section of text, you'll have a **Notebook Homework** list of problems to do, a **Turn-In Homework** list of problems to do, and a set of **Computer-Based Problems** to do. The **Computer-Based list** will be longer than the **Notebook** list, which will be longer than the **Turn-In** list.

I. Treatment of **Computer-Based Homework (MML or WA)**: You need to be able to do all the problems in the problem set. These problems are mostly the routine problems; however, there are some that are learning problems. Do not neglect any of these problems.

II. Treatment of **Notebook Homework (NB)**: You need to be able to do all the *types* of problems assigned in the **NB** list. These problems will give you the bulk of the *repetition* and *practice* that you need. The effect of not doing enough of these problems will be indirect: you will not have an adequate mathematical grounding, and your performance on our tests will reflect this. Hence, your grade will suffer, but more importantly you yourself will suffer in future course-work (and even, possibly, in your future employment) where you will need to be able to *use* the math skills that we cover. Remember, just as learning is cumulative, ***not-learning is cumulative***.

There will also be a direct effect of not doing enough notebook problems: many of these problems (or their *first cousins*) will appear on tests and quizzes!

I shall check up on your notebook homework progress in two ways:

#1. I shall try to make a "spot-check" of all the notebooks each Monday (for MWF classes) or Tuesday (for TR classes) at the beginning of class.

⁵ A "POD" is a "Problem of the Day."

#2. **On test day when you come into the classroom to take the test, the first thing you will do is put your homework notebook on my desk.** I will take your notebook with me and grade it. I shall make it a priority to get your notebooks back to you on the next class period, so that you can continue to enter your notebook homework problems.

I will grade your notebook on its degree of *completeness*, not on the correctness of your work. The **Notebook Homework** problems will mainly be odd-numbered problems, whose answers are in the book. Consequently, I shall assume that you will have checked your answers for correctness. Also, if your notebook has some semblance of order and neatness, you will get some bonus points. Conversely, if your notebook is sloppy and disorganized, I will subtract points.

Notebook Homework is extremely important. Everyone will be turning in notebooks, and it is important to me that we have uniformity in the type of notebook you use. There is a separate document specifying the notebook's physical requirements.

Caution: In the past, some students have followed these procedures, **but** they have simply copied the answers out of the back or the book with no work shown, or they have copied the solutions out of the Solutions Manual or from other students' papers.

No credit whatsoever will be given if I detect any sort of copying of the solutions from any source. As a matter of fact, I'll probably issue a *negative grade* on such work!

III. Treatment of the Turn-In Homework Problems -- including PODs (TI & POD): Your approach to the **TI / POD** problems will be **far more structured**. You will write-out and solve each problem using the format specified here. *I will collect problem sets at assigned times*. The problem sets will be read thoroughly and graded carefully. Your grade on the **TI / POD** problems will provide an important component of your *homework / quiz* average, and this composite average will count as a one hour test. Thus the effect of not doing enough of these problems will be direct and profound.

I am going to try to spell-out exactly how I want you to prepare your **TI** problems for submittal. There are twelve (12) requirements for your **turn-in homework**. **You will be graded on the degree to which you follow these homework instructions as well as how you work the problems!**

- (1) Use standard 8.5 in. by 11 in. paper (lined, un-lined, or grid) or engineering paper.
- (2) Do NOT submit homework on pages with "***spiral debris***" on the edge.
- (3) Write on one side only (we'll call this *the front side*).
- (4) Do NOT use red ink or green ink. (Red hurts my eyes, and I grade in green, so green is *my* color.) My *preference* is that you write-out the problem in either black or blue ink and work-out the solution in (dark) pencil.
- (5) Always leave a 1" margin at the top of the page and a 1" margin on the left. (There are no requirements for margins on the right or the bottom.) Never write anything whatsoever in the left margin. And the only thing that you write in the top margin is the heading.

- (6) The **HEADING** goes in the top margin of the *first* page of a given section of **TI** problems. It is the only writing that goes in the top margin, and here's what it looks like:

(Top of Page)	NAME (LAST, First) ASSIGNMENT #: _____ DATE (Due) DATE (Submitted) MAC2302-58354
Section 1-2: p. 9: # 2 , 3, 10, 14 (4)	
#2/4 [Sect. 1-2:p.9:#3] <u>BLAH, BLAH, BLAH</u>	
<u>Solution:</u> Step 1: _____ Step 2: _____ (etc)...	

Thus, as you can see, each **homework set** must be **labeled**. How do I want you to do this? Let's use as an example a fictitious homework assignment for section **1-2**.

HERE IS YOUR HEADING

- In the **upper right hand top margin** of the first page (only) of this homework set write **your name (LAST, first); then the Assignment Number (or POD #); then the date due, then the date submitted, then the Course & Ref #**. (It would be nice if you would (yellow) highlight these items).
- Then *on the center of the top line of the page write-out the problem numbers of assignment 1-2 and then strike through the number of each problem that you complete, like this ⁶:*

Sect. 1-2: p. 9:# ~~2~~, 3, 10, ~~14~~ (4)

This way I can see at a glance which problems you've done and which problems you haven't done.

- Then after you have listed the problems, write (4) , where 4 stands for the *number of problems in this homework set*, such as "4" in the example above.
THIS CONCLUDES THE "HEADING" FOR YOUR HOMEWORK.

⁶ In this example, we have *done* numbers 2 and 14. We have not *done* numbers 3 and 10. This is just an example, of course, and I certainly would like for you to do all the **TI** problems, but don't fib about those that you do; just strike through the numbers of the ones that you do, and leave *un-struck* the ones that you don't do.

- (7) Within a problem set, each problem should be worked in the following manner: (Here's the "layout" for a problem)
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#1/4 [Sect. 1-2:p.9:#2] < **HERE YOU WRITE-UP THE PROBLEM , preferably in pen.** >

If Johnny can mow 2 lawns in 5 hours and Beth can mow 3 lawns in 7 hours, how long will it take Beth and Johnny working together to mow 9 lawns? ⁷

Solution: Blah, blah, blah. Therefore, blah, blah, blah.

< **HERE YOU DO YOUR WORK AND WRITE-UP THE ANSWER, preferably in pencil.** >

Please note:

You must write-out the **whole problem**. This includes the **instructions** to the problem, because the instructions are an integral part of the problem. Now, in some problem sets a sequence of similar problems may have the same instructions. After having written these instructions once, you can simply say "*Same Instructions*" for each subsequent similar problem.

I prefer that you write-out the problem in pen.

Then write-out your **solution**. You must show all significant steps in writing-out your solution.

(For some problems, and/or parts of problems, where it is appropriate for the work to be done on your calculator, you may write *calculator work*.)

However, *you must always write-out any formulas you are using, and in any "calculator-assisted" problems you must always write out the complete 10-digit display from your calculator before rounding off the result as may be required!*

I prefer that you write-out your **solution** in pencil. (Since you may have to make corrections in your work.)

The guiding principle in how detailed your write-up should be is this: *Write down enough so that if, later (a day, a week, or maybe even a month...), you were to come back and look at the problem, YOU WOULD BE ABLE TO FOLLOW YOUR OWN WORK AND SEE WHAT YOU DID!*

As this process of paying careful attention to the execution of your work gets a bit tedious, I have significantly reduced the number of problems which I would otherwise assign for you to do. However, there are three important aspects of this homework that I must clearly state:

- Your homework grade will play a significant part in your course grade.

⁷ By the way, can you solve this little problem?

- Many of the homework problems which I have selected (both notebook problems and turn in problems) will be *very similar* to test-type questions.
- I will take points off your homework if you do not follow these instructions.

Please attempt to be as neat as possible within the limits of a reasonable time period.

Caution: In the past, some students have followed the instructions above, but have simply copied the solutions out of the Solutions Manual or from other students' papers. **No credit whatsoever will be given if I detect any sort of copying of the solutions from any source. As a matter of fact, I'll probably issue a *negative grade* on such work!**

(8) The problems which I assign to be turned-in will be chosen carefully. They are important. Many are test-type questions, and others are important concept-type questions and / or practical applications that you must know, but which are too long for an hour test. Therefore, these problems should be worked-out carefully and completely, with *enough detail* so that each step will be clear and easy to follow. Think of it this way: You are creating a self-contained study guide for test review. Or perhaps pretend that you are the teacher and put in enough steps so that an "average student" (namely me) could follow your work. I want you to be able to look back on any one of these problems later (a day, a week, a month, or a year) and be able to follow just what you did to solve the problem.

The idea here is *not* to see how fast you can get through the problems; it *is* to see how well you can learn the procedures of problem solution. Sometimes this takes *time*. I want you to work on *speed* later, when you are preparing for a timed test! And I do want to share with you the fact that these activities (doing homework and preparing for a test) are two separate activities; they have different styles, different goals! And they take place at different *times*!

- (9) ***BOX YOUR ANSWERS.*** You may also wish to box or circle any intermediate results that are important along the way to getting the answer.
- (10) You are now in training for a professional occupation, so be professional.
- (11) Each section of homework is a separate submittal. All the problems in a given section should be put in order and stapled together — with a vertical staple in the upper left-hand corner.
- (12) Finally, be advised that I give **bonus points** for **neatness**. Now don't go hog-wild, but try to be neat, and it *will* pay off!
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