

GUIDELINES FOR WRITTEN HOMEWORK

There are many levels of understanding. What I expect you to aim for in this course is *understanding at the level of being able to explain what you understand*. Therefore *you will be graded on the correctness of your solution method and on the clarity and completeness of your explanation of your solution as well as on your final answer. You might receive no credit if you have the correct answer but do not explain how you got it, or if you have the correct answer but obtained it by an incorrect method*. For many students, these criteria are more rigorous than they are used to, so here are some pointers to help get you get started in the right direction.

- Good writing is different from oral communication. Oral communication occurs in "real" time and can benefit from non-verbal communication and question asking; written communication can't. Also, written communication (such as homework) has the possibility of revision; therefore you are expected to revise your homework solutions before handing them in! Unless you are an unusually able writer of mathematics, don't hand in a first draft. (By the same token, when you are communicating orally, take advantage of the possibilities of that medium. Similarly, a blackboard is a different medium than a written solution, so do *not* take what I write on the blackboard as a model for written homework. And when you present a solution at the board, practice taking advantage of the ability to talk, add to diagrams as you go, etc. that are possible in that medium.)
- Remember that (as pointed out in the Reading Guidelines handout) textbooks usually omit some details. *You will be expected to include the types of details that are omitted in the textbook*.
- Be sure to read the handout *Sample Solutions and Grades* to get an idea of how much detail is expected in written homework.
- Write in complete sentences.
- As pointed out in the Sample Solutions, there is often more than one good way to solve a problem. (There are often many poor or incorrect ways, too.) Similarly, there is usually more than one good way (as well as lots of poor ways) to write up the solution once you've figured it out. Therefore I cannot (and should not) give you a template saying "use this form". So please don't ask me, "How do you want me to write up this solution?" However, there are guidelines that you should stay within. They are in this document.
- Use standard *mathematical* notation and conventions, as used in class, wherever possible. Don't use your own invented shorthand or notation. Don't use shorthand from other areas that may be confusing in mathematics (for example, using + to

mean "and".) Study the *Sample Solutions and Grades* and examples in the book (remembering that the latter may leave out details you need to supply) if you are not sure what the standard notation and conventions are.

- Remember to define any symbols or terminology you introduce. Examples of how to introduce notation:

"Let x be the height of the rectangle."

" $F = ma$, where F is the force, m is the mass, and a is the acceleration."

- Use "therefore", "thus", "hence", "then", or "consequently" to say that what comes next is a logical consequence of what was stated previously. Do *not* use "let" for this purpose.

Example of *incorrect* usage: Let $x = 2$. Let $x^2 = 4$.

Example of *correct* usage: Let $x = 2$. Then $x^2 = 4$.

"Since", "because", and "so" can also be used to express reasons.

Correct Examples: Since $x = 2$, $x^2 = 4$.

$x^2 = 4$, since $x = 2$.

$x = 2$, so $x^2 = 4$.

$x^2 = 4$, because $x = 2$.

Incorrect example: Since $x = 2$, therefore $x^2 = 4$.

- Use mathematical symbols correctly. Two that are often misused:
 - The equals sign. Remember that it stands for "equal", or "equals", or "is equal to", or "are equal to." Examples of common misuses:

i. $2x + 1 = 3x - 4$

$= 5 = x$

(This says that $3x - 4 = 5$ -- certainly not what is intended.)

ii. $n = \text{even}$ (The writer presumably means "n is even".)

- The infinity symbol (∞). Remember that infinity is not a number, so don't use the symbol in expressions such as $\infty - 2$. Most uses of this symbol are as

part of a complex piece of notation, such as $\int_0^{\infty} f(x)dx$ or $\lim_{n \rightarrow \infty} n = \infty$, where the

individual parts of the notation do not each have independent meaning.

- Be careful not to use pronouns ambiguously. Watch out especially for "it."
 - Example of *poor* (confusing) usage: "To find it, multiply it by three, then add two to it." The word "it" stands for three different things in this sentence! The reader needs to be a mind reader to understand what the writer intends. And perhaps the writer is confused, too.
 - Example of *good* (clear, unambiguous) writing: "To find $f(x)$, multiply x by three, then add two to the result."
- A related error is to use the same symbol to mean two different things in the same context.

- Incorrect example: $\sum_{n=1}^n n^2$ (The symbol n is used both for the index of summation and for the upper limit of summation.)

- How to correct: Use different letters for these two items -- for example, $\sum_{n=1}^N n^2$

- Remember that someone has to read what you write.
 - Please write legibly. (If you can't, please use a word processor.)
 - Using a pencil rather than a pen will allow you to some revision without starting a new piece of paper, but if you have too many erasures, please start again on a fresh piece of paper.
 - Write in one column, rather than having arrows pointing to the next step -- or worse, expecting the reader to read your mind to know where to look for it.
- In writing your revised draft for homework, pay attention to the following:
 - Check for correctness of mathematics, including reasoning.
 - Reorganize and reword to improve clarity and flow of explanation.
 - Try to find a balance of words, equations, and pictures that is best for the particular problem.
 - Be precise, not vague.
 - Make diagrams understandable. Common errors include making the diagram too small, not labeling it clearly, or including too much in a single diagram when a series of diagrams would be clearer.
 - Consider having another student read and critique some of your write-ups.
- In writing your revised draft, you may find errors or lapses in reasoning that require you to start over. This is common -- finding errors is one of the reasons to write a revised draft. So be sure to allow enough time to start over if need be.
- If you cannot completely solve a problem, you may (and probably should) carefully write up what you have and then indicate where you're stuck. You'll be better off than if you write down a bunch of BS in the hope that you'll get some credit for it.

Please note: On exams, you will not have the time to revise as much as on homework. On exams, I *will* expect you to give complete explanations, clearly enough explained so that I can follow them without too much difficulty, in order to receive full credit for an exam problem, but I *won't* pay as much attention to organization, wordiness, grammar, etc. as on homework.