

Homework expectations for Math 3560

Solutions to homework exercises must be correct, obviously. But simply writing relevant words and symbols on a page is not enough. Mathematics must be *communicated*, and the way you present a solution deeply affects how correct it appears. One of your goals this semester should be to sharpen your presentation.

1 Submission

Each student is expected:

- to submit an individual write-up of the solutions on time each week;
- to provide a neat copy, stapled in the correct order if there are multiple pages;
- to clearly indicate, on the top of the first page, her/his name and the date of the assignment;
- to indicate, on the first or last page, fellow students with whom she/he collaborated.

Typed or handwritten assignments are acceptable.

2 Style

The solution to each homework exercise should be:

- clearly labelled and contiguous within the write-up;
- written in complete sentences with proper spelling, grammar, and punctuation (if an exercise requires only a *single* computation, then no further text is necessary).

There are, roughly speaking, two kinds of processes you will need to convey in your write-ups: *computation* and *logical reasoning*. You should also be mindful to portray the *context* in which both of these occur. If an exercise requires multiple computations, for example, then you should indicate the relationships between them. If it asks why a certain statement is true, you should write a complete sentence, possibly restating the assertion, and indicating the connection between the statement and the reason you give.

3 Two examples

Suppose an exercise in the text says, “Compute the following products of complex numbers, and simplify the expressions”, and it has three parts. Your homework should look something like this:

p. 12 #4 Complex multiplication

(a) $(1 + 2i)(-2 + i) = -4 - 3i$

(b) $(1 - 3i)^3 = 1^3 - 3(1)^2(3i) + 3(1)(3i)^2 - (3i)^3 = -26 + 18i$

(c) $4(a + bi) = 4a + 4bi$

When you are asked to “prove” or “show” a statement, this means *give a convincing and logical argument that the statement is true*. In your write-up, you can either write the full statement of the exercise, or simply write the statement to be proved. Then give your argument. For example, suppose you are told, “Show that the derivative of a polynomial is a polynomial.” Then you might write:

p. 16 #7 The derivative of a polynomial is a polynomial.

Proof. Let $f(x) = a_0 + a_1x + \cdots + a_nx^n$ be a polynomial. By the sum rule for derivatives, we can differentiate each term separately. The derivative of a_0 is zero. By the power rule, $(x^k)' = kx^{k-1}$ for each $k \geq 1$. Because each a_k is a constant coefficient, $(a_kx^k)' = ka_kx^{k-1}$. Therefore the derivative of f is $f'(x) = a_1 + 2a_2x + \cdots + na_nx^{n-1}$, which is a polynomial. \square

Some things to keep in mind when writing mathematical arguments:

1. you should deal with *the most general case that applies*;
2. there will often be *special cases* as well (in the above example, the term a_0 is a special case);
3. you should *define and use clear and concise notation*;
4. you should *state and use known results* to reach the desired result.

Writing proofs takes practice, and this course is intended in part to start developing your communication in mathematics.

Good luck! I have every confidence you’ll succeed at making as much out of this opportunity as possible.