

Math 301, Spring 2023 — Homework 0

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Due January 27 at 5:00 pm

Instructions. This introductory problem set is partly to get you familiar with the class structure and technological tools. I know it's fast to have homework due right away, so thanks for jumping in! You will submit responses to Problem 8 below on Gradescope.

Problem 1. Please respond to the [start of semester survey](#) on Moodle.

Problem 2. Bookmark the [class web page](#) and read the syllabus there.

Problem 3. Download our class [textbook](#). If you have trouble using this official link, take a look at our class Moodle page for another way to get the textbook.

Problem 4. We will use Piazza as a forum for posting questions and answers related to class material. Please use this [sign-up link](#) for our class.

Problem 5. Read these [guidelines for good mathematical writing](#), written by a math professor at Harvey Mudd.

Problem 6. We will use [Gradescope](#) for homework submissions. If you haven't used it before, you should make an account with your MHC email address and read this [short tutorial](#) on submitting assignments. Your account should be linked to our course automatically but you might need the entry code **7GPPWD**. Please let me know if you have trouble.

Problem 7. LaTeX is a piece of software, as well as a programming language, that is used for typesetting documents; it is particularly aimed at writing mathematics since it's very easy and fast to type symbols and formulas, at least after some practice. It is similar to HTML in the sense that writing is done in a text file with some code that is written in the LaTeX language. This text file, which we'll refer to as a LaTeX file, is then compiled to produce a nicely formatted document. Some software is needed to compile a LaTeX file into a pdf file, and I'm going to suggest that you do each of the following steps.

1. Go to [overleaf.com](#) and make an account. Overleaf is a cloud based LaTeX editor and compiler. It's easy to set up and use.
2. Install software locally on your personal computer. If you use Windows, you should install [MikTeX](#) (the complete system). If you use macOS, you should install [MacTeX](#). If you use Linux, you should install TeX Live using your package manager. Each installation will include a program (such as TeXworks or TeXShop) that is used for editing LaTeX files.
3. Try compiling the [homework template file](#) I've made for you. In Overleaf, upload the file and hit the compile button. On your computer, open the file with TeXworks or TeXShop and hit Ctrl-T on Windows and Linux or Command-T on macOS. Here is the [pdf output](#) that should be produced when you compile.

If you find that Overleaf works well, it will be fine to use it primarily instead of using the local installation. However, it's probably good to have the local installation as a backup.

Problem 8. There's one more problem to get you practicing with LaTeX and Gradescope. Use the LaTeX template to help you type up the following things in a new document.

1. In an exercise environment, which you should call Problem 0.1, rewrite the following statement:
For every integer $n \geq 2$, the inequality $n^2 > n + 1$ holds. Next, in a proof environment, write a proof for this statement using induction.
2. In an exercise environment, which you should call Problem 0.2, rewrite the following statement:
For every integer $n \geq 4$, the inequality $n! > n^2$ holds. Next, in a proof environment, write a proof for this statement using induction. Here are couple hints:
 - (a) Remember that the factorial function is defined like this: $n! = n(n + 1)(n - 2) \cdots 3 \cdot 2 \cdot 1$.
 - (b) When proving the induction step, you should make sure to use the induction step first. After that, it will be helpful to use Problem 0.1 that you wrote a proof of above.
3. On a new page, make a new exercise environment, calling it Problem 0.3 and type something in. It could be a question about course material or anything else. I want to make sure you know about the new page command since it's often helpful to put problem solutions on separate pages. It's also helpful to see how submitting multiple pages on Gradescope works.