

0. To make it easier to work on Lean code on your own machine, please install *VS Code* and its Lean extension. Visit the following website for instructions.

<https://lean-lang.org/install/>

In the last step, you can choose to either create a new blank Lean project where you can begin storing your files, or you can download an existing project. You may find it useful to download the textbook's Lean files as a starter project, so that you can experiment with them. To do so, in the last step, you should click *Open Project* → *Download Project* and then type this address: <https://github.com/npflueger/math2001>. This will download a “fork” I have made of the Macbeth textbook, in which I have updated the Lean code to the more recent version 4.33.0.

I am happy to help you troubleshoot during the installation; please reach out if you encounter any problems!

1. Look up a proof that $\sqrt{2}$ is irrational. There is one classic proof that you likely have seen in Math 220, which is fine to choose, but I'd encourage you to fish around online and see if you can find an interesting and different proof. Explain the proof in English, and then see if you can sketch out how you think you could write it in Lean. There will be syntax, tactics, and tools, that you don't know yet; that is okay! For now, I'd just like you to see how much you can sketch out. Then briefly describe in a couple sentences what else you need to learn to complete your chosen proof in Lean. (You will get full points on this question for a good faith effort; do not stress about it.)
2. Choose a theorem you've seen before that you'd like to understand how to formalize in Lean, and state it. You don't have to include the proof. You can choose a theorem or homework problem from another math class you've taken or are taking. You can also choose a problem from a book, math contest, or anywhere else.
3. *Lean exercises* Fill the *sorries* in the following Lean file. These are a combination of exercises from the textbook and problems based on examples from class.

<https://npflueger.com/teaching/222-26fall/psets/pset2.lean>

The link above will let you download the file to your computer, so that you can work with it in VS Code. You can also work on the problems in a web browser if you wish; you can load them in Lean Live with the following link.

<https://live.lean-lang.org/#url=https%3A%2F%2Fnpflueger.com%2Fteaching%2F222-26fall%2Fpsets%2Fpset2.lean>

Submission instructions: You should now be added to this course on Gradescope. Submit your answers to the written questions to the “Problem Set 2” assignment there. Your lean code should be emailed to me, as with Problem Set 1.

First quiz next week. We will have our first quiz for this course next week on Thursday at the end of class. It will be 15 minutes long, and will include 2-3 problems. Each problem will be a short proof to be written in Lean by hand. The problems will all be either directly taken from problem sets or slight modifications of problems on homework. You should try to write correct Lean syntax as much as possible, but will not be penalized for misspellings, incorrect theorem names, and the like.