Below are some suggestions for your final project. You are not required to pick a project from this list — you can come up with your own project, and this list is only meant to help guide you. Similarly, you can modify any project on this list as you like.

1) Any project on the midterm suggestion list can be done if you have not done it yet.

2) Report on Fibonacci numbers. For example, you could try to understand the relationship between Fibonacci numbers and integer solutions to the equation $x^2 + y^2 - 3xy = -1$, as explained in Proposition 4.1 in https://arxiv.org/pdf/1307.5493.pdf/

3) Write more about the history/importance of complex numbers, starting from Bombelli’s imaginary roots of the cubic.

4) Try to explain some of the story around the cubic formula, the quartic formula, and the nonexistence of a quintic formula and above. Make sure to not repeat too much that we said in class, but there should be significant space to write about new material; for example, you could try to explain some of the very basic concepts in Galois’ proof: the overall proof is hard to explain, but you could use the statement of the insolvability of the quintic as a jumping off point to discuss some concepts relevant to Galois’ proof, for example you could give the definition of a group, and try to explain why it is relevant to symmetry.

5) Talk about issues involving computation, which has been an important problem in the history of mathematics. You could start by writing about how ancient cultures computed quantities like square roots. You could write about Napier’s invention of logarithms, and their importance for computation. You could even talk about the significance of computers today, and a bit about how they work.

6) Go into more depth than we did in class about Descartes and his works. For example, what kind of math problems was Descartes interested in? How did his Cartesian geometry help with this? You could perhaps explore a bit more of his philosophy as well.

7) Go into more depth than we did in class about Newton’s works. What is in The Principia Mathematica? What are Newton’s major
insights in that work? What are some mathematical aspects of the work? You could, if you want, even discuss some issues in Newtonian mechanics today, like the “two body problem” or the “n body problem”. For that matter, you could explain a lot more about how Newtonian mechanics works.

8) Go into more depth than we did in class about the history and importance of probability theory. You could also discuss some related material. For example, what is Laplace’s equation, and why is it named after him? What are some contributions of Chebyshev? These are just a few ideas.

9) Write more about perfect numbers and Mersenne primes. How many perfect numbers are known? What is the largest one? How many digits is it? How do people try to find perfect numbers today? What are some conjectures about perfect numbers? You could explain Euler’s proof that every even perfect number is given by Euclid’s method.

10) Report on the history of Fermat’s last theorem. You can go all the way to the present, where there is a lot of interesting math to discuss.

11) Go into more depth than we did in class about any of the following figures: Euler, Gauss, Lagrange. We will only have time to scratch the surface of their mathematical work, so you should be able to say much more.

12) There are many important mathematical developments from the 19th and 20th centuries that we will not have time to discuss. You could look at the final few chapters of your book for ideas. Just to give a few examples, you could discuss Ramanujan’s life and works, which are fascinating. (There was recently a movie about this.). You could try to explain some of Poincare’s contributions. You could write about Fourier series. You could talk about the importance of the university system in the 20th century. There are many possibilities.