Generalized Fibonacci Project

MATH 242 • Spring 2026

Due: Monday, March 9

(Following the due date and initial grading, there will be an opportunity to revise and resubmit for a higher grade.)

In this project, you will explore your own generalized Fibonacci (or "gibonacci") sequence. First, choose your own integers a, b, r, and s, and define your sequence:

$$G_0 = a$$
$$G_1 = b$$
$$G_n = rG_{n-1} + sG_{n-2} \text{ for } n > 1$$

Make sure your sequence is not a multiple of the Fibonacci, Lucas, or Pell sequence. Also make sure your sequence also is not a geometric sequence.

Near the top of your Mathematica notebook, state your chosen values of a, b, r, and s. Then print the first ten (or more) numbers in your sequence, so that it's clear what sequence you will use for the rest of the project.

Search for identities involving your sequence, using Chapter 2 of our text as your guide. *State at least four conjectures*, supported by computational evidence. Your conjectures should be reasonably different from each other, not simply small variations of each other.

For projects in MATH 242, *communication* is as important as *computation*. You should turn in a well-organized notebook that clearly explains, using sentences and paragraphs, what you computed and what conclusions you can draw.

This project will be graded on the EMRN scale, as described in the syllabus. To receive a grade of *Meets Expectations*, your notebook should exhibit the following characteristics:

- You demonstrate computational exploration of your generalized Fibonacci sequence.
- You state four conjectures involving your sequence, supported by computational evidence.
- Your reasoning is explained using sentences, and your notebook is well-formatted and easy to read.
- In your section headings and text cells, mathematical notation is typeset correctly, especially subscripts and superscripts. (For example, type x^2 instead of `x^2`, and a_1 instead of `a_1`.)
- No significant gaps or errors are present.

To receive a grade of *Excellent*, your notebook should further exhibit all of the following:

- Your conjectures are nontrivial, meaning they don't result from some simple algebraic operation. Your conjectures are substantially different from each other.
- At least one of your identities involves two or more parameters.
- Computational methodology demonstrates mastery of the computational techniques that we have studied in this course.

- Mathematica code is of high quality, demonstrating skillful use of programming constructs (e.g., variables, lists, functions, modules).
- Exposition is clear and precise, thoroughly explaining your methodology and reasoning. Your Discussion should include things like assumptions made designing your methods, limitations of your computational techniques, and possible extensions for future study.
- The work extends beyond the project requirements in a creative or insightful direction. For example, you could prove one of your conjectures, thus obtaining a *theorem* about your sequence.