

MAT 331 Fall 2023, Homework 3

The Mathematics Genealogy Project

The Mathematics Genealogy Project is a database of mathematics doctorate recipients that stretches back almost 1,000 years and contains more than 250,000 mathematicians. It lists their advisors, students, doctoral granting institution, year, and more. The genealogy project can be found at

<https://www.genealogy.math.ndsu.nodak.edu>

In this homework, we will investigate a few mathematicians and their genealogy. On the course webpage is an adjacency matrix with data from 2019 and index corresponding to the ID that Math genealogy assigns. For instance, your lecturer, James Waterman, has ID 272096 (but will not appear in the adjacency matrix). Enter an ID into the quick search in math genealogy to find more information about a mathematician. Whether two mathematicians are adjacent is given by being a student or advisor of the other. We will consider a graph with mathematicians as vertices, and edges as described. Load `genealogy.mat`.

Caution: this data set is very large! Use the commands `shortestpath` and `conncomp` instead of the functions we discussed in class.

- (1) How many connected components does this graph have? What is the size of the largest connected component?
- (2) Who is the mathematician with the largest number of immediate students and advisors?
- (3) How many mathematicians does the genealogy project list as having no advisor and no students?
- (4) While your lecturer does not appear in this graph, his advisor does. What is the shortest path from Gwyneth M. Stallard (ID 172620) to Isaac Newton (ID 74313)? Present your results with ID number, name, and year each as separate columns in an array.
- (5) Bonus: Benjamin Peirce (ID 80886) is often regarded as the first American research mathematician. How many unique paths, with *no repeated vertex*, are there from Peirce to our grader's advisor, Theodore Drivas (ID 220588). Do any of these paths include a mathematician with a doctorate from a non-American university?