Penn State University - University Park

MATH 35, General View of Mathematics

Fall 2023

Lecturer: Hongda Qiu

October 10, 2023

1 Catalog Description

This course presents a general view of a number of mathematical topics to a non-technical audience, often relating the mathematical topics to a historical context, and providing students with an opportunity to engage with the mathematics at an introductory level.

2 Prerequisite

Math 21 or satisfactory performance on the mathematics proficiency examination.

3 Reference

1. E.T. Bell, Men of Mathematics: The Lives and Achievements of the Great Mathematicians from Zeno to Poincaré

More references will be mentioned during classes.

4 Contact Information and Office Hour

Lecturer: Hongda Qiu

Email: hqiu@psu.edu

Office: Room 402, McAllister

Office Hour: TBA

5 Course Format

Course material is on Canvas. The course will be split roughly into three units:

Unit 1: Ancient Mathematics. We will discuss the contributions of ancient mathematicians such as Euclid, Liu Hui, al-Khwarizmi, classical mathematical theories and results including Euclid postulates, Pythagorean theorem, Liu Hui's π algorithm and brief history of mathematics in ancient Greece, China and Persia.

Unit 2: Early Modern Mathematics. We will discuss the work of mathematicians such as Euler, Gauss, Fermat and Galois. We will also cover brief introduction to several main mathematical communities at that time such as French mathematicians, German mathematicians and Russian mathematicians.

Unit 3: Mathematics and Contemporary Life. We will discuss how mathematics is applied and how it affects our daily life. Specified topics may include mathematics in computer system, cryptography and coding theory.

A more detailed course plan could be found at the end of this file.

6 Assignments

Our assignments include the following items.

1. Homework: We will have five homeworks during the whole semester. Each homework is consisted of a mission that students could choose from a given list of alternatives and will be graded upon submission.

   Deadline of Homework: All homeworks are due Friday, December 8th.

2. Group Assigment: Students will be required to work in groups (3-5 individuals, no more than 6 per team) to finish these assignments.

Group Assignment I: Study the biography and contribution of a famous mathematician, give a presentation (10-15 minutes, no more than 20 minutes) and answer the questions from the audience during and after the presentation.

The final presentation should be addressed with slides and is suggested to contain but not restricted to the following items: a detailed introduction to the whole life of the chosen mathematician, a brief introduction to the historical period and the country that he/she lived and the academic community he belonged to, the main questions solved by him/her or the main theory built by him/her. In the math part, you do not need to present rigorous argument; instead, you could briefly introduce the idea of the theory and give some examples or applications.

Deadline of Group Assignment I: Presentation–Friday, November 24th.

Group Assigment II: Interview a faculty member (professor, teaching faculty or graduate student) of Department of Mathematics of PSU, then share your experience in class (10-15 minutes, no more than 20 minutes). The interview is basically expected to be 30-45 minutes long, but you could talk a bit more with your interviewee if your chat goes well. The content of interview may include but not restricted to the following items: life and its connection to mathematical career, understanding of math, thoughts of math education and former or current research.

Steps of interview

a. Choose an interviewee from a list of given names (we will do this in the class of first week), study the material of your targeted person from his/her personal website and other information from the internet (some of them have biography on Wiki), then contact to get in touch with him/her. You may ask for his/her (approximate) availability during the semester and preferred method of meeting, but do not make actual appointment with the interviewee at this stage yet. This step shall be finished before the end of the first week (Sunday, August 27th).

Remark: All contacts in the whole process shall be finished by a fixed representative from your group.

b. Make a detailed plan of interview, including list of alternative questions, and submit it to me. Each group is expected to talk with me in person at least once before going further. All interview plans are expected to be submitted before Sunday, October 1st.

c. Prepare for your actual interview. Schedule with your interviewee, choose the method of meeting (in person/online) together and send him/her a full list of questions that you may ask. **Your interview should be finished no later than Friday, November 24th. Under this basic requirement, the date of appointment and method of meeting should be decided up to the convenience of the interviewee.**

d. Interview. Please be respectful and patient to your interviewee during the whole process. In an actual interview, you do not need to stick to your plan; please, however, **make sure you get the consent from the interviewee when taking a new action** such as raising a new question (especially when it is unlisted or personal-related), asking for phtographing or video-shooting etc.

e. After the Interview. Write a thank-you letter to the interviewee to express your appreciation of his/her participation. You may attach he/she photos or videos during the interview. When you email this letter to your interviewee, please put me on carbon copy to demonstrate that you have finished the whole interview.

Presentation of Interviewing Experience: The presentation of Group Assignment II should include but not restricted to: a brief introduction to your interviewee (including a biography and his/her main job at the Department of Math), the list of your questions with answers from the interviewee, your impression on the interviewee BEFORE and AFTER the interview, and your feelings about the whole activity etc. Photos and short videos are encouraged with the consent of the interviewee.

The presentation should be addressed with slides. To demonstrate the participance of every individual in your group, a photo of the whole group and the interviewee shall be included. If the interview is done online, use a screenshot including everyone in the meeting room instead.

Deadline of Group Assignment II: Interview–Friday, November 24th; Presentation–Friday, December 8th.

Remark

(a) Each presentation could be scheduled on any date before the deadline.

(b) Each presentation could be given by any individual(s) of your group. However, it is highly recommended to adopt different casts for the two assignments. After finishing each of the assignments, the representative of your group should send me an email specifying the contribution of each person.

7 Grading

Grades will be assigned on the basis of 300 points, distributed as the following:

Total	300
Homework	100
Group Assignment I	100
Group Assignment II	100

Letter grade will follow the PSU standard policy as the following:

Letter Grade	Interval
A	92.5%-100%
A-	89.5%-92.5%
B+	86.5%-89.5%
B	82.5%-86.5%
B-	79.5%-82.5%
C+	76.5%-79.5%
C	69.5%-76.5%
D	59.5%-69.5%
F	0%-59.5%

8 Deferred Grade

Students who are currently passing a course but are unable to complete the course because of illness or emergency may be granted a deferred grade which will allow the student to complete the course within the first six weeks of the following semester. Note that deferred grades are limited to those students who can verify and document a valid reason for not being able to take the final examination.

9 Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the

University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Acts of academic misconduct include, but are not limited to:

1. Passing off the work of another student as your own. This includes direct copying of homework answers, (discussing and working on homework as a group is OK, as long as your answers are your own;);

2. Using external aids, including other students, to assist you on quizzes;

3. Plagiarism (copying portions of another work without citation) on writing;

4. Improper usage of generative artificial intelligence. You must complete this work entirely on your own. You may not assist other students or use any online sites (e.g., Course Hero or Chegg), technologies (e.g., ChatGPT, language translators), tools, or sources that are prohibited. If your instructor permits the use of ideas, images, or word phrases created by another person or by generative technology, you must identify their source. You may not share any information about, or from, this assessment with others. If you have questions about these instructions, you should discuss them with your instructor before you begin.

"Academic dishonesty includes, but is no limited to, cheating, plagiarizing, [. . .], facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with academic work of other students. [. . .] A student charged with academic dishonesty will be given oral or written notice of the charge by the instructor. If students believe that they have been falsely accused, they should seek redress through informal discussions with the instructor, the department head, dean or campus executive officer. If the instructor believes that the infraction is sufficiently serious to warrant the referral of the case to Judicial Affairs, or if the instructor will award a final grade of F in the course because of the infraction, the student and instructor will be afforded formal due process procedures."

From Policies and Rules, Student Guide to the University Policy 49-20.

Based on the University's Faculty Senate Policy 49-20, a range of academic sanctions may be taken against a student who engages in academic dishonesty. Please see the Eberly College of Science Academic Integrity homepage for additional information and procedures.

10 Counseling and Psychological Services

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

1. Counseling and Psychological Services at University Park (CAPS) (http://studentaffairs.psu.edu/counseling/): 814-863-0395

2. Counseling and Psychological Services at Commonwealth Campuses (https://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/)

3. Penn State Crisis Line (24 hours/7 days/week): 877-229-6400

4. Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

11 Code of Mutual Respect and Cooperation

The Eberly College of Science Code of Mutual Respect and Cooperation pertains to all members of the college community; faculty, staff, and students. The Code of Mutual Respect and Cooperation was developed to embody the values that we hope our faculty, staff, and students possess, consistent with the aspirational goals expressed in the Penn State Principles. The University is strongly committed to freedom of expression, and consequently, the Code does not constitute University or College policy, and is not intended to interfere in any way with an individual's academic or personal freedoms. We hope, however, that individuals will voluntarily endorse the 12 principles set forth in the Code, thereby helping us make the Eberly College of Science a place where every individual feels respected and valued, as well as challenged and rewarded.

12 Educational Equity

Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity via the Report Bias webpage (http://equity.psu.edu/reportbias/).

13 Disability Services

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Student Disability Resources office (SDR) at 814–863–1807 (V/TTY). For further information regarding SDR, please visit the Student Disability Resources Web site at http://equity.psu.edu/student-disability-resources. In order to receive consideration for course accommodations, you must contact SDR and provide documentation (see the documentation guidelines at http://equity.psu.edu/student-disability-resources/guidelines). If the documentation supports the need for academic adjustments, SDR will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact SDR and request academic adjustment letters at the beginning of each semester.

14 Suggestions to Students

1. Have good, regular and enough sleep. Do not stay up late. Having good rest shall be your first preparation to learn math. A good sleep could enhance the performance of your brain (if one is not working, try one more). Successful self-regulation on sleeping will also help you build your confidence to learn math.

2. Do everything early. Do not try to learn math in one single night–especially the one before deadline or exam. Rushing on math will bring you nothing but a nightmare!

3. Take math easy. Be serious of learning, including attending classes and doing homework. However, do not take math itself too seriously. You must be aware that each of those concepts, propositions or theorems you learnt might have cost those most reputated mathematicians (think about these big names, Euler, Lagrange,

Gauss, Riemann....) decades or even centuries to build, derive and prove. These knowledge have been taunting in thousands of talented brains before it finally gets into your nightmare–you are not alone, for sure. Thus, you definitely do not have to feel upset when failing to understand any content in classes.

4. Face the horror. Please read in case if you find the former paragraphs not helping. Mathematics, unfortunately but obviously, is regarded as the apparatus of horror throughout many people's whole career on campus. Think about yourself to be a lonely, isolated warrior fighting with a phantom that can only be seen by yourself. People around may encourage you, but no one can help you fully defeat it so as to ultimately get away from it. Actually, "getting away from it" is not even a good idea to implement your strategy against math–horror is something that can follow you lifelong and dodging cannot help. To beat your horror, you shall turn back, try to face it, observe every detail of it and build an overall view of it. Build a spirit to fight with it. Every time you step into the classroom, open your notebook or touch your homework, you shall remind yourself–you are not learning, you are fighting.

15   Course Plan

Section	Content
1.1	Introduction to Ancient Mathematics
1.2	Euclid, elementary geometry and how to make an argument in mathematical language
1.3	Pythagorean School, Pythagorean Theorem, Zhao Shuang and String Graph
1.4	Hippasus, elemantary number theory and the First Mathematical Crisis
1.5	Liu Hui and the approximation of π
1.6	Al-Khwarizmi and elemantary algebra
2.1	Descartes and the idea of coordinates and functions
2.2	Galois, the idea of Groups and symmetry
2.3	Euler, Seven Bridges of Königsberg and Euler's theorem
2.4	Gauss and his work
2.5	Cantor, the idea of set, the concept of infinity and Cantor's diagonal argument
3.1	Mathematics and computer system
3.2	Mathematics and modern culture