

Math 545: Number Theory 1, Fall 2021

Instructor: Kevin Milans (milans@math.wvu.edu)

Class Meetings: TuTh 4:00pm-5:15pm in Armstrong Hall 313

Office Hours: Tu 11:30am-12:30pm, W 2:30pm-3:30pm, and by appointment, in ARM 408H and Zoom

Webpage: <http://math.wvu.edu/~kgmilans/teaching/fa21/math545/>

Welcome: Welcome to Math 545: Number Theory 1. I have the highest hopes and expectations for our class this semester. To truly learn advanced mathematics, you must actively engage the material in an aggressive way. Before you proceed to a proof, think about the theorem. Play around with some examples. What principles are at work? Why is the theorem true? How might the proof be structured? Thinking about these questions will build a bridge between the new material and your existing knowledge. Those connections will make it much easier to understand and remember the proof, appreciate its beauty, and to recognize when similar principles and techniques apply to new problems. After reading the proof, you might try some modifications. Can any of the hypotheses be weakened? Can any of the conclusions be strengthened? Is there any way to modify the proof to make it more natural or easier to understand?

Learning Outcomes and Course Goals: Students will be introduced to a wide variety of topics in classical number theory, including divisibility, the Euclidean algorithm, Diophantine equations, congruences, primitive roots, quadratic residues, number-theoretic functions, distribution of primes, irrationals, and combinatorial methods.

Prerequisite: Math 155 or Math 156.

Textbook: *Number Theory* by George Andrews, Dover Publications.

Homework: Homework is crucial to gain a full understanding of course material. Homework is assigned approximately once every two weeks. Each student may submit up to one homework electronically in PDF format to the instructor's email address; for all other homeworks, a *physical hardcopy* of your homework must be submitted. All homeworks must be prepared with an *electronic typesetting system*, preferably LaTeX.

In working on the homework problems, you may make use class notes, the course textbook, and discussions with fellow students and the instructor. Use of any other source (including written work of other students, search engines, other textbooks, and research articles) is forbidden and constitutes cheating. Your written work must be entirely your own, which implies that *you must fully understand everything written down on your paper under your own name.*

Homework Time Impact: Please plan to spend an average of about 20 hours per homework assignment (10 hours per week). Part of learning involves trying approaches that do not work. This takes time and can be frustrating, but take heart! Everyone who studies and conducts research in mathematics goes through the same struggle, so you are not alone. Just make sure you allot enough time.

Homework Grading Policy: Homework may be submitted up to 1 week late for a score of 75% of what its on-time score would have been. Homework that is more than 1 week late is not accepted. When computing your homework average, your lowest scoring homework is dropped.

Homework Workshops: Homework workshop sessions will be held once a week. The workshops are dedicated to working on the current homework assignment in small groups. Students are encouraged to make serious attempts to solve some problems before the weekly sessions. Students will discuss the problems, brainstorm ideas, and find solutions together. The instructor will be available for assistance and to offer hints. Attendance is optional but recommended. The instructor reserves the right to cancel the evening homework sessions if they are consistently not well-attended.

Exams: We will have a midterm exam in class on Tues. Oct 5. The final exam is Wed, Dec. 15, 8am–10am. If your final exam score is higher than your midterm exam score, then your final exam score will replace your midterm score. All students must take the final exam during the scheduled exam period, unless specifically exempted by university rules.

Grading Rubric: Course averages are converted to letter grades according to the scale on the right. The instructor reserves the right to lower these thresholds.

Homework	60%
Midterm Exam	15%
Final Exam	25%
Total	100%

A: 90–100	B: 80-89.9
C: 70-79.9	D: 60-69.9
F: 0-59.5	

Other Policy Notes: These policies cover all absences and contingencies, including those due to university Days of Special Concern. In truly exceptional cases, students may be excused from additional homeworks. Students with such circumstances should contact the instructor as soon as possible, and appropriate arrangements will be made on a case by case basis.

Academic Integrity: You are expected to practice the highest possible standards of academic integrity. Any deviation from this expectation will, at a minimum, result in an academic penalty of a score of zero on the assignment or test in question. Additional disciplinary measures are possible. For more information, see the university’s Student Conduct Code.

COVID-19 Statement: WVU is committed to maintaining a safe learning environment for all students, faculty, and staff. Should campus operations change because of health concerns related to the COVID-19 pandemic or other campus-wide emergency, it is possible that this course will move to a fully online delivery format. If that occurs, students will be advised of technical and/or equipment requirements, including remote proctoring software.

In a face-to-face environment, our commitment to safety requires students, staff, and instructors to observe the social distancing and personal protective equipment (PPE) guidelines set by the University at all times. While in class, students will sit in assigned seats when required and will wear PPE according to current University guidelines. Students who fail to comply may be referred to the Office of Student Conduct for sanctions.

COVID related absences fall under the University attendance policy, available online. As detailed in the policy, a student who becomes sick or is required to quarantine during the semester should notify the instructor. The student should then work with the instructor to develop a plan to complete the course learning outcomes while he or she is absent.