Welcome to MAT 243 online Session C. If you want to study ahead, you can find the course videos at https://vidman.asu.edu/index.php/menu. Dr. Boerner posted the lecture pdfs on his websites at https://math.la.asu.edu/~boerner/.

Course Title: Discrete Mathematical Structures
Course Number: MAT 243
Credits: 3
Prerequisites: Minimum Sophomore standing; MAT 210, MAT 251, MAT 265, or MAT 270 with C or better.

College algebra (MAT 117, 170, 171 or equivalent) is a prerequisite of all these courses and therefore an indirect prerequisite to MAT 243. MAT 243 students are expected to be fluent in college algebra, including and especially the laws of polynomials, rational, exponential and logarithmic functions.

As an **Information Technology major** you may have an additional choice for completing the requirement for MAT 243, Discrete Math Structures, by taking **MAT 211, Math for Business Analysis instead.** Please review each course description, as these courses are different. If you are interested in taking MAT 211 in place of MAT 243, please consult with your advising team to discuss your next steps. Do not make a choice to drop this course and take MAT 211 without consulting with an advisor first. Major maps and course requirements can change, and we can take no responsibility for the correctness of this information.

Faculty: Hedvig Mohacsy

Course Discussion Board: Ed Discussion will simply be referred to as Discussions in the rest of this syllabus.

Email: hmohacsy@asu.edu (when you email me, please include **MAT 243 C** in the subject line.) Only use email for private questions. Subject questions should be asked on Discussions.

- Use only your official ASU email to contact me.
- Do not forward your ASU email to a personal account.
- Do not use the Canvas messaging system.
- Do not try to communicate with me by leaving messages on Canvas assignments and tests.

If you sent me an email from a non-ASU email account, even a gmail account that is not affiliated with ASU, I will not respond to it. Before you email me, check this syllabus, and in particular the FAQ section to see whether your question is already answered there.

Catalog Description: Logic, sets, functions, elementary number theory and combinatorics,

recursive algorithms, and mathematical reasoning, including induction. Emphasizes connections to computer science.

Important: you are expected to have at least a basic understanding of programming concepts in this class. This is implied in the "connections to computer science" part of the catalog description. Here is a quick self-test: if you don't know what the value of the variable x is after the following pseudo-code program has been executed, you are not ready for the computer-science related parts of MAT 243:

x = 1;

if (x > 2) then x = x + 2

College algebra is an important prerequisite skill for the class. It is an implied prerequisite. The class requires you to have passed an introductory calculus course, which in turn requires you to have passed college algebra or precalculus. There is a college algebra quiz in the first module that tests you on some of the college algebra skills you need to succeed in this course. For some parts of this class, strong algebra skills, in particular in the laws of exponentiation, are imperative.

List of subjects covered:

Subjects in **bold** are foundational for the rest of the class.

Introduction to Logic (Propositional Logic and Propositional Equivalence)
Predicate Logic (Predicates, Quantifiers and Nested Quantifiers)
Arguments and Rules of Inference
Proofs
Sets and Set Operations
Functions, Sequences and Summation
Algorithms (reading assignment only)
The Growth of Functions
Complexity of Algorithms (reading assignment only)
Divisibility and Modular Arithmetic
Integer Representations and Algorithms
Prime Numbers, GCD, Euclidean Algorithm and LCM
Mathematical Induction
Recursively Defined Functions and Sets, Structural Induction
Linear Recurrence Relations
Combinatorics (Counting, The Pigeonhole Principle, Permutations and Combinations)
Inclusion-Exclusion
The Binomial Theorem (extra credit)
Probability (extra credit)
Relations, Equivalence Relations

Honorlock Disclosure Statement: Exams in this course are proctored remotely. You will use a Google Chrome extension called [Honorlock](#) for your exams. Thus, you MUST use the Google Chrome browser for all of your exams in this class. Honorlock is a remote proctoring service that uses your computer's webcam and microphone to record your exam space to promote academic integrity. This service is free for ASU students.

If you do not wish to do this, then you should drop/withdraw from the course.

Unicode Disclosure Statement: the quizzes and some of the exams use unicode math symbols. You must configure the device you use to access this class to display the required symbols correctly. One test, the proof paper, asks that you enter your answer in plain text and unicode. **You are asked and strongly encouraged to practice unicode math skills by using unicode symbols to represent mathematical notations in discussion posts when possible.** Please see the Technical Requirements section for details.

Third-Party website Statement: Any (parts of) exams, assignments, reports, or solutions to these, from current or previous semesters, posted to any website not affiliated with ASU will result in academic integrity disciplinary actions against the students posting them and the students using them.

Learning Goals and Time Commitment Required

The course teaches you about logic, sets, functions, elementary number theory and combinatorics, recursion, and mathematical reasoning, including induction and proof writing. It emphasizes connections and applications to computer science.

More detailed **learning outcomes** are individually described in each module.

Activities used for instruction and assessment of learning include: watching instructional videos, reading/reviewing the corresponding written presentations, reading the textbook, WeBWorK homework, written homework, quizzes, midterm exams, a final exam and a separate proof writing assignment.

You are expected to spend several hours EACH DAY on this class including weekends. You will almost certainly not succeed if you can only work on the class during the weekends.

The instructor is fully aware of and sympathizes with the time limitations of students who have families and full-time jobs. To accommodate these time limitations, there are no daily quizzes, and exams become available on the night previous to the official testing day.

Students subject to real life and career restrictions must accept however that they are still responsible for completing all coursework and putting in the required number of hours. Students who cannot invest the time necessary to complete the coursework should drop the course.

Students are expected to take note of examination dates (midterms and final exam) and schedule other activities so that they do not conflict with the examination dates.

It is important to access your online course materials for ASU Online and iCourse sections to ensure you do not miss any course assignments or supplemental instruction. Failure to attend class (or access your online course) at the start of the term could result in an instructor-initiated drop for non-attendance.

The section "Drop and Add Dates/Withdrawals, Administrative Drop, Incomplete" under Policies specifies how you can be administratively dropped from the class.

ASU FACULTY DO NOT HAVE THE POWER TO DROP STUDENTS FROM THEIR CLASSES AFTER THE ADMINISTRATIVE DROP PERIOD IS OVER. If you are registered for the class but turn in no work, you won't be dropped from the class. You will receive a failing grade.

If you receive an **academic status report** that says that you are failing the class, you must act on it. Contact your instructor to discuss your performance in the class.

Time Zone (IMPORTANT!): This class runs on Arizona time. All due dates on Canvas and WeBWorK are in Arizona time.

Here is where it gets a little complicated. Arizona time is technically MST, all year round. Arizona does NOT change to Daylight Saving Time. As a result, Arizona is in the same time zone as the Mountain states during the winter months and in the same time zone as the Pacific states during the summer months.

Grading

Grade	Percentage
A+	97-100%
A	93 – 96.99%
A-	90-92.99%
B+	87 - 89.99%
B	83 – 86.99%
B-	80 - 82.99%
C+	70 - 79.99%
C	60 – 69.99%
D	50 – 59.99%
E/F	Below 50%

The grade table on the right shows how final percentage grades will be converted into letter grades.

This table means just what it says. A grade of 89.9% is a B+, not an A-. A grade of 59.9% is a D, not a C. Please do not email me after the class is over and ask for the next higher grade because you feel that you are close. Granting such requests consistently and fairly would require me to keep lowering standards in such a way that everyone in the class would get an A+.

[As soon as I lower the A- to 89.9%, another student will justifiably complain that his 89.8% is close to an A-. After I lower the A- to 89.8%, another student complains that her 89.7% is close to an A-, so now I must lower the bar again, to 89.7%. Then to 89.6%, then to 89.5%, etc. You can see where this is going. There will always be someone who is close to the next higher grade but did not make it. The cut-offs have to be set somewhere, and the table above is how they are set in this class.]

Grades reflect your performance on assignments **and** adherence to deadlines and course rules.

You are expected to be aware of the deadlines. Deadline reminder messages may be sent as an occasional courtesy, but you should not expect them or rely on them.

The following table gives the weights that will be used to calculate your final grade:

WeBWorK Assignments	5%
Quizzes (excluding syllabus quiz)	5%
Written Homework Assignments	5%
Proof Paper on Structural Induction	10%
Practice Exams for Test 1-3, Final	5%
Tests 1-3	50%
Final Exam	20%

Important: Canvas idiosyncratically refers to all graded examinations, including midterms and final exam, as "quizzes", but for the purpose of this syllabus and grading, "quizzes" are small, unproctored, graded examinations with a due date but without a time limit that count collectively for 2% course credit.

Quizzes and written homework (not Webwork) allow late submissions with a late penalty of 5% per day. The two lowest quizzes and two lowest written homeworks will be dropped. Do not ask for time extensions on them.

You have two submissions on written homework assignments. Only the latest version will be graded. DO NOT submit another version if you have already submitted one by the due date. Written homework cannot be submitted more than three days late.

Webwork and exams have to be completed by the nominal due dates.

You should always verify that you have submitted an electronic assignment correctly. For fairness reasons, if there is no record of you completing an electronic assignment, the instructor cannot take your word for it that you completed it.

You need to take and pass Test 0 and the Syllabus Quiz before you can take exams in the class.

Many of the quizzes are challenging. Please see the FAQ for a fuller explanation of what the quizzes are intended to accomplish.

Please do not ask for exam or final grades to be *curved*, i.e. arbitrarily raised for the purpose of giving students better grades than the ones they earned. Your grades reflect your understanding of the material. It is up to you to learn the material sufficiently to earn the grades you want or need. **The three tests and the final exam offer generous amounts of built-in extra credit.** For example, on test 1, you can earn 100 points, but 92 points are a full score. If you earn 100 points, you get a grade of 100/92 ~= 108.7%. **There is extra credit on Webwork too.**

You can use these opportunities to re-gain lost points, but those extra points have to be earned.

Do not ask for exam re-takes. These requests will not be granted. The essential pedagogical function of exams is to act as a strong inducement to progress through the course **on schedule**. Another purpose is to measure that progress against the expectations in the course schedule. Exams would cease to function in either capacity if an option existed to retake them later.

Having been sick or otherwise distracted by an emergency does not entitle you to a retake. By starting an exam, you agree that you are in a condition fit to take the exam.

There is no Y grade in the course. Do not ask to be assigned the grade of Y.

Your final grade will be assigned based on the course credit you have earned during the period from the first day of class to the final exam, with weights assigned to grade components as given in the table above. Your opportunity to earn course credit ends with the final exam.

Important: Canvas does not support extra credit. To implement extra credit, the instructor will download grades after each test, apply extra credit and re-upload the grades into a separate container assignment in the grade center that only stores the corrected grade. To see your detailed results on tests, you need to click on your test, not the container assignment.

For example, to see your detailed results on Test 1, you need to click on "Test 1 (Proctored)", not on "Test 1 (counting extra credit)"

Grading the written homework assignments is the job of a grader or IA (instructional assistant). Please take this into account when you are discussing a grading decision made on the homework with the teacher. Please don't leave messages or comments intended for the teacher in the text box of your homework.

Exams are always graded by the teacher.

Grading decisions on written homework or exams are final one week after the relevant grade has been entered, or one day after the last day of class, whichever comes first.

Do not attempt to contact graders. You are not supposed to know who the graders are, much less talk to them in person. ASU is currently accepting Canvas's inability to hide the grader's identity from students, but that does not change the rule that you can't talk to them, and they can't talk to you. This rule does not apply to IAs (instructional assistants). If you have questions about grading, contact the teacher.

Success and Studying for the class:

This is an online course. To be successful, check the course daily, read announcements, including those on Discussions, read and respond to course email messages as needed, complete assignments by the due dates specified and if at all possible well ahead of the due date, communicate regularly with your instructor and peers on Discussions and make sure to remain aware of the assignment schedule to stay on track.

DO NOT MAKE INFERENCES ABOUT DUE DATES AND TIMES. If exams follow some discernible day of the week pattern, for example, that doesn't mean that the final exam will follow the same pattern. Do not make guesses when assignments and exams are due.

To master the concepts, complete all homework assignments and review/study the powerpoints and the textbook thoroughly. It is important that you practice active engagement. What this means is explained below in the subsection "Does course content need to be memorized?"

Study Advice:

- It might be helpful to create your own lists (or perhaps 3x5 cards) of definitions, procedures and theorems. Writing helps to build active knowledge.
- You must learn and study continuously throughout the duration of the class. Relying on "just in time" cramming for exams is an ineffective study technique and will virtually guarantee failure in the class.
- Some of the exams ask you to write proofs. Proof writing skill is like learning a language. To learn a language, you need to practice speaking it. Passively reading or listening to it will not suffice. Likewise, the ability to write proofs can only be gained by writing proofs, not by merely reading proofs other people wrote. It is imperative that you practice writing proofs in preparation for being tested on your proof writing skill. It is unlikely that you will write a correct proof on an exam if it is your first attempt at writing a proof.

- Do not abuse help. Math learning happens when you struggle with a problem. If you ask a tutor or on Discussions how to get a problem started at the slightest sign of difficulty, you will not get as much learning out of the problem as you would have if you had spent some time first thinking about the problem and trying to connect it to the material covered in the lectures.
- Don't go shopping for answers. Some of the material in the class is abstract, and abstract ideas require an investment of mental effort of your own to understand them. If you do not understand a concept, do not immediately jump to the conclusion that it must be the lecture's fault for not being clearer, and go looking on the internet for a better video or ask the teacher for more resources. Videos cannot do your thinking for you. Don't confuse information gathering with studying, and don't mistake superficial how-to knowledge you may gain from Khan Academy videos for conceptual understanding. Time searching for third party videos is better spent working with the information you got and asking for clarification on Discussions.
- Review the theory connected to the problem carefully. What concept am I not understanding correctly? When you struggle with a problem like this for some time, and then have an aha experience, that's when mathematical learning happens.
- Create your own examples to clarify and illustrate the theory. Mathematical learning requires active engagement with the material. No amount of passive consumption is a substitute for that. You have to be a doer, not a consumer.

Mathematical Reasoning

Mathematical reasoning is one of the official learning goals in the course description of the class.

Perhaps high school got you used to thinking that "doing math" is just mindless imitation, following cookbook recipes and plugging numbers into formulas. It isn't. Real math is about coming up with the formulas in the first place and being able to justify them. It's about critical thinking, about seeing common patterns, about understanding how procedures we learn depend on assumptions and agreements we made in the first place ("definitions"), questioning whether or verifying that, or judging to what degree, the agreements are appropriate to the situation at hand, and being aware of how different assumptions lead to different "right" answers. It's about independent application of a theory you have learned to practical situations where the connection may not be obvious. It's about ability to modify the theory if an application demands it.

This is ultimately about teaching you employable skills. If Wolfram Alpha can do it, no one will pay you to do it. Mindless application of procedures is for computers. They're way better at that than you will ever be.

What this means for this course is that some homework questions are intentionally designed to not be solvable by mindless imitation, by just looking up a similar example in the videos and substituting new numbers. It is not an oversight of the teacher or bad course design that there is no practically identical problem in the videos or the textbook that would allow you to solve your homework problem by just changing numbers. It is an intentional difficulty, built in to stimulate your mathematical reasoning ability and your understanding of the underlying theory.

You should feel free to ask questions about such problems, like all homework problems, on Discussions, but you should expect the teacher to give you only hints to stimulate your own thinking process. Do not expect to receive a fully worked solution to a slightly similar problem. The learning goal is not to blindly follow a recipe, it's to get you to apply what you have learned independently to a new situation. It wouldn't be a new situation, or independent application, if you have an example problem with a model solution to imitate.

Learning Mathematical Reasoning

Mathematical reasoning can only be learned through persistent practice. Homework is where much of this practice happens. The lecture material is designed to help you develop conceptual understanding, not necessarily walk you step by step through every homework problem. If you find yourself challenged by a homework problem, and cannot find a fully worked model problem in the course videos that looks the same, that does not mean that the material was not covered in the lecture. The theory necessary to solve the problem was covered, and now it is your job to determine how the theory applies to the homework problem. When you connect some of the dots yourself, that's when mathematical learning happens.

Struggling with a problem, perhaps for an extended period of time, is an expected and normal part of this process of developing mathematical reasoning skill, not a breakdown of your educational experience. Persistence in this struggle usually pays off, and results in deeper conceptual understanding. If you give up after a solution has not presented itself after a short time, and find a tutor or third party video that walks you through this exact type of problem, you are depriving yourself of the intended learning experience.

Learning mathematical reasoning is a lot like building strength or cardiovascular fitness - it happens slowly and somewhat painfully, through regular exercise, and cannot be cheated. If there is no pain, then there is no gain. Services like Chegg and, to a lesser degree, Khan Academy, are the personal trainers who lift the weights for you as you watch, or the golf cart service that drives you around the running track. You will take away a certain familiarity with the "gym" or the scenery of the "running track" that can be mistaken for learning, but the exams will dispel that illusion.

If you found a third party video that made it much easier to complete a homework assignment, ask yourself honestly whether you actually ran the distance, or were being chauffeured to the destination. If you never broke a sweat, it's probably the second.

A habit of taking shortcuts on the homework will come back to haunt you on the tests, in future classes and in your professional career. It is not turning in the right answers that will prepare you for the future. It is having found the right answers on your own.

Does course content need to be memorized?

The question sometimes comes up whether parts of the content, such as the logical equivalence rules of chapter 1, the common summation formulas of chapter 2, or the big-O relationships of chapter 3 need to be memorized. The question is not easily answered because it is based on the

false premise that those particular bits of knowledge can only be acquired through (blind) memorization. The best answer is, students are expected to acquire a detailed familiarity with the course content, but not through memorization.

Certain types of knowledge, such as dates of historical events or the sizes of planets, are basically "random" and can only be learned through memorization. Mathematical knowledge, on the other hand, is not "random" but interconnected. All facts except the so-called axioms follow logically from other, simpler facts. Mathematical knowledge rests not on memorization, but on an understanding of this web of logical relationships. It is naturally acquired through (usually several iterations of) theoretical study and practical application.

For example, there is no need to memorize that "given that p implies q and given q, p must be true" is a fallacy. This follows directly from the fact that a conditional and its converse are not logically equivalent.

If you find yourself wondering whether this or that bit of course content needs to be memorized, then you are not studying correctly. Ask yourself why the formula or relationship is true, or what motivated the definition. Can you prove it? Create some examples of your own to test the formula, or to illustrate the relationship or definition. Think about how the fact in question is relevant to applications. If you are a CSE major, ask yourself how you might encounter this issue in a programming or software design context. Consider how the formula, relationship or definition could be generalized.

This is what is meant by "actively engaging with" the content. Once you are done with that, you will find that you have not only naturally committed the fact to memory, but you have done so in a way that is superior to mere memorization. Trivia that are merely memorized are easily forgotten again, having made no lasting impression on your mental environment. Ideas that you have thought through, on the other hand, will be yours for a lifetime.

Some words on learning styles

Despite the persistent popularity of learning style theories among students and educators, research has shown that learning styles in the sense commonly believed - hardwired limitations on the ways in which we can effectively receive and retain knowledge - do not exist, only learning preferences. You may like to receive information visually, but that does not make you a "visual learner" in the sense that your brain is fundamentally unable to process, say, verbal information; nor does it mean that you will retain information better if it is presented to you visually.

Research has failed to produce evidence that customizing teaching towards individual learning preferences improves learning outcomes. There are well-founded concerns among some psychologists and researchers that the practice of identifying and labeling students according to learning style models imposes limitations on students' abilities and is actually harmful for learning.

This is likely the case in higher math, such as it is taught in MAT 243. Mathematical understanding benefits from synergy, from holistic understanding that engages all our senses and mental abilities and includes verbal/intuitive, verbal/conceptual, symbolic/algebraic, numeric, visual/geometric, and physical. We all have these abilities, though there is individual variation in how strong they are. Do not sell yourself short by denying yourself the full range of your abilities and believing that all but one are beyond you.

Regardless of your own learning preferences, try to develop your own mental images, evocative verbal descriptions and memorable physical metaphors for abstract concepts. This is what most people in STEM do.

Calculus provides some good examples for how a mathematical concept can be understood in different ways and appeal to different kinds of thinking. Consider the derivative of a function f.

- Symbolically / algebraically, f'(x) is defined as the *limit* of (f(x+h)-f(x))/h as h goes to 0.
- Numerically, you can understand this by making a table of values of the quotients (f(x+h)-f(x))/h for smaller and smaller h values.
- A visual/geometric interpretation of f'(x) is the *tangent slope* of f at the location x.
- A physical interpretation is obtained if you think of x as time and f(x) as position of a moving object. Then, f'(x) is *instantaneous velocity* at time x. The phrase evokes a mental image of movement and change.
- A verbal/conceptual interpretation is that f'(x) is the *instantaneous rate of change* of f at x, which lends itself to verbal/intuitive conceptualizations of f'(x) being a measure of how quickly a function's value is changing at or very near a point.
- Some have suggested calling the derivative of f the *sensitivity of f* instead. It is unfortunate that that is not the official name, because unlike the fairly meaningless word derivative, the word sensitivity describes what it is that f'(x) actually measures: how *sensitively* the function's output reacts to changes in input at a point x. f'(x) = 3 means if you change the x value a little, the y value will also change, but by about 3 times as much as the x value.

Discrete Math learning similarly benefits from good mental images, verbal descriptions and physical metaphors. Take for example the concept of the conditional. Conditional relationships can be phrased in many different ways, some of which are covered in the lecture: if .. then, .. only if .. , and using the words "necessary", "sufficient" and "unless". Those are the standard verbal metaphors for conditional relationships. In addition, we can create our own illustrations and analogies.

- As suggested in the lecture, you can think of the conditional as a *promise*. This analogy makes it clear why the conditional is automatically true if the premise is false- it's because the condition upon which the promise was based was never met in the first place.
- You can come up with any number of mechanical cause and effect relationships that illustrate p → q:
  - p represents whether the heating is turned on in a home, and q represents whether it is warm in the home. Then p → q is always true: when the heat is on, it will be warm. When the heat is off, it could still be warm (for example, due to outside

heat), but it can also be cold. p → q simply doesn't give us any information about q in the case that p is false.

- o p represents whether the sun is shining, and q represents whether it is day time. Then p → q holds: when the sun shines, it must be day time, and when the sun doesn't shine, it could be a cloudy day, or night. So a true p forces a true q; a false p doesn't give any information about q, and permits either truth value of q.

The point here is not to provide additional lecture material, but rather to illustrate what active engagement means in practice and to encourage you to create your own metaphors, examples, analogies and applications of the material.

Back to the topic of learning styles, if you have a strong preference for one type of learning, then focus in your active engagement with the material on translating the content into your preferred way of processing and memorizing information. The key is to not wait for the teacher to do this translation for you, or to seek out third party resources that do it for you, but to do it yourself. It's only when you do this mental processing yourself that you create the conditions for deeper understanding.

WeBWorK

You will submit some homework through WeBWorK, which you access by going to webwork.asu.edu and clicking on your class. Please observe that the webwork server is independent from Canvas. You do not need to go through this page to access Webwork. Bookmark the webwork main page and then use that bookmark to go to webwork directly.

If you added the class late, you may not have been imported into the WeBWorK roster. In that case, it is your responsibility to notify your instructor of that fact and send you full name, ID and your ASU login name to the instructor. Failure or delay in doing so will not entitle you to time extensions, or to be exempt from homework assignments that you missed. **Do not contact ASU tech support if you cannot log into Webwork.**

You will see all due dates when you log into WeBWorK. There will be no reminders of these due dates. You are expected to be aware of them and to work on the assignments on an ongoing basis. There will be no time extensions for homework assignments.

Murphy's Law of online homework systems: something always happens on the evening of the due date. You should work on homework assignments continuously and finish well before the due date. Failing to do this will not entitle you to a time extension in case of a server breakdown, broken computer or personal emergency.

If you need help with the homework, don't email the teacher. Ask on Discussions. Below, you will find guidelines on how to ask questions on Discussions.

WeBWorK questions are set to allow only a limited number of attempts. This is intentional, to discourage trial and error solutions, or worse, a purely combinatorial approach wherein you go through all combinations of answers on a multiple choice question until you find the right one,

thereby reducing the homework to a guessing game. If you are not certain what the answer is and you are on your last attempt, seek help on Discussions.

Do not make webwork assignments harder for yourself, your peers and the teacher than they actually are. Webwork understands un-simplified answers. If the correct answer to a problem is 10*9*8*7*6, then you should enter 10*9*8*7*6. Webwork will accept that. Simplifying that into 30,240 wastes your time, and if it turns out to be the wrong answer and you need to ask for help on Discussions, makes it harder for the instructors and your peers to help you because the simplified answer does not reveal your thought process.

There is no automated synchronization of WeBWorK grades with the Canvas grade center. The Canvas grade center will not show you your current WeBWorK grade. The teacher will manually export WeBWorK grades and import them into Canvas to compute final grades after the final exam day.

Written Homework: typed and in PDF

For each module, there is a written homework assignment. Please read and follow the [Instructions for Written Homework](). In particular, homework solutions must be typed, with correct mathematical typesetting, and be submitted in PDF format.

You will **not** receive reference solutions for the written homework assignments after due dates have passed. Do not ask for solutions to be posted. Absence of publication of solutions is not an omission, it is a deliberate policy.

In most cases, grader feedback will provide sufficient information for you to understand the mistakes you made. If you feel that your solution to a specific problem was incorrectly graded, or if you don't understand what you did wrong despite grader feedback, ask specifically about this problem on Discussions. The teacher will answer your questions, but not supply a reference solution.

A certain measure of independent work is expected from you on written homework. Discussions are not supposed to be a mechanism for the teacher to dictate to you what to write in every detail or to essentially "pre-grade" your homework so that a perfect score is a foregone conclusion. For that reason, and to avoid creating temptations for other students to engage in academic dishonesty, do not post complete solutions until the due date of a homework assignment has passed.

Discussions: It's not a bug, it's a feature.

Do not think of being challenged by homework questions and needing help as a breakdown of your educational experience in this class, and Discussions as a kind of tech support that must fix this breakdown for you asap by essentially telling you the answer.

When you ask a question about a challenging problem on Discussions, which leads to a discussion that makes you verbalize your thinking and ends with you having that aha experience

of what you were missing - that's not the system breaking down, or the teacher's plan failing you. The discussion is **not** the teacher doing emergency repair work that should never have been necessary with a better course design. **It's the system and the assignments working as intended.** This is when math learning happens. It's the Socratic method.

This system requires your active participation and initiative. The more you put in, the more you receive.

You are expected to read what has already been discussed on Discussions about a problem before posting your own questions. Do not post questions that have been asked and answered already. If you make posts that indicate that you did not read what has already been said, the teacher may refer you to existing posts. Not having to sift through a lot of discussion that has already occurred is one of the benefits and privileges of starting your written homework and asking your questions early.

Ask for help by asking a specific question and explaining your thought process so far. Give your "best" wrong answer if possible. You have to give the rest of the class and the teacher something to work with. Merely saying "I don't understand how to do this" or "Webwork doesn't accept my answer" will usually just provoke follow-up questions and waste time, rather than result in usable answers.

Airing generic grievances about not understanding whole concepts or sections, along the lines of "I spent hours trying to figure out the growth of functions, it makes no sense to me" is even less helpful. The teacher and classmates won't even know where to begin if you write that. It may very well be the case that you don't understand a whole set of ideas, but it is your job to identify a starting point. Identify the first thing you don't understand, and then ask specifically about that.

Help us (us meaning the teacher and the other students) help you by giving us something to work with - include what you DO know or think you know already, not just what you don't know.

For example, instead of asking "I just don't understand codomain", you might ask "I thought what you explained as the codomain was the range. Can you give me another example to clarify the difference?"

Or, instead of saying "The floor function makes no sense to me!" you might say "I don't understand how the floor function acts on negative numbers. I feel that the floor of -2.5 should be -2, but it is -3. Can you explain this again or in a different way?"

Student Rules of Engagement (Discussions)

- All questions related to quizzes and homework should be posted on Discussions. Homework or quiz questions emailed directly to the instructor will not be answered.
- Homework, quiz and practice exam questions can be asked and answered before the due date, but no complete solutions posted. After the due date, you may show, post and discuss complete solutions.

- Never discuss the content of exams on Discussions, not before, and not after the due date. Email exam content- and grade-related questions to the instructor. Logistical issues concerning exams can be talked about on Discussions.
- The class is asynchronous and taken by students living in different time zones. To ensure an equal opportunity and equal access to help, all help is given on Discussions. The instructor is not available for face to face meetings or virtual (online) office hours. Making personal office hours available in any form would create a two-tier system of help and starve Discussions of content. Questions asked and answers given during office hours would not be posted on Discussions and would not be available to all students.
- When you post on Discussions, always include identifying information for the problem in the subject line, such as: WeBWorK Propositional Logic, problem 7.
- Please search the forum for the number of the problem you seek help on to see if there is already an open thread. Do not start new threads if one already exists on the same problem. Please read the existing discussion first.
- Please include work. **It is best if you include work as text with unicode math, because that work can be copied and pasted and is thus easier to respond to, and it will even display correctly in email notifications.**
- You may also photograph your written work and insert the image **inline**. On WeBWorK problems, include a screenshot of your version of the problem. Trim the image so it shows only the problem (and your current answers), not the entire webwork window, your entire browser or even your entire desktop. **All pictures must be inline. Do not attach pictures as files.**
- If you use a standard word processor like LibreOffice Writer or MS Word to compose written homework, and if you typeset your math using unicode math symbols, rather than the equation editor, your math writing will behave for all intents and purposes like ordinary text and can be copied and pasted directly into Discussions.
- If you copy & paste from Webwork into Discussions, edit the pasted text to be legible. Webwork math formulas are redundantly served in a primary and a fallback format. If you do not edit the pasted text, all formulas will be duplicated back to back, which can make the problem difficult to read.
- Please be courteous at all times. No vulgar, demeaning, or aggressive language will be tolerated.
- Do not use Discussions to air grievances or to campaign.
- Do not use Discussions for personal messages. Those should be sent by email to the instructor directly. Subjects that make a message personal include grade discussions, illness and DRC accommodations.
- Stay on topic. Do not use Discussions for discussions not related to this class.
- Do not use Discussions to link to or promote third-party forum sites not affiliated with ASU.
- Keep a civil and friendly atmosphere. Discussions work best when there are a lot of students willing to engage the forum.
- Please do not expect immediate replies. Instructors usually check the forum daily. In the meantime, other students are encouraged to add feedback and commentary. Instructors may also deliberately stay in the background so as to promote student-led discussions.
- Failure to adhere to these requirements may result in your posting privileges being revoked.

Three midterm exams, one proof paper exam and one final exam will be administered through Canvas and the online proctoring system Honorlock. You don't have to pay for Honorlock. ASU pays for it from your tuition.

You start all your exams by clicking on "Honorlock ASUO". You can only access the exams by going through Honorlock. Honorlock will enter passwords for you. Take test 0 to practice Honorlock test taking.

 All Students will take their tests during a 30 hour period from 6pm to 11:59pm MST on the day after the test opened. Once you open the test, you only have 75 minutes (1 hour for the proof paper) to complete your test, or until 11:59pm MST of the final testing day, whichever comes first.

"The Take-It-At-Your-Own-Risk-Period": waiting for the very end of the testing period to take your test is reckless. If you open a test at or later than 8pm on the final testing day, you do this at your own risk. Please be responsible and plan to take all your tests on the evening of the first testing day (at or after 6pm) or on the morning or afternoon of the final testing day.

All tests are closed-book, closed-web, closed-notes, etc. More detailed information about the content of the exams and permitted testing aids is available on the [Information about Exams and Quizzes](#) page, which is considered part of this syllabus.

Testing procedures are the same for online and icourse students. NO ON-CAMPUS PROCTORING IS OFFERED FOR ICOURSE STUDENTS to ensure that all students in the class are tested under the same conditions.

There are no test retakes or "corrections", and you won't get extra credit assignments to make up for a bad test. If you miss a test for no good reason, your teacher is not obliged to give you a makeup test, or if a makeup is given, it does not have to be of the same format or difficulty as the original test.

The following procedures have to be observed:

1.When you are ready for your exam, be sure you are using a Google Chrome browser and the [Honorlock](#) extension. (If you use a different browser, the program will prompt you to download the Google Chrome browser first.) You must use a standard computer. Chromebooks are also allowed, but you won't be able to complete your exams on a tablet, iPad, other hybrid device, or a phone.

For more information about Honorlock computer requirements visit https://honorlock.com/support/.

For more information about Honorlock, visit their knowledge base page https://honorlock.kb.help/; for answers to frequently asked questions (FAQ), visit https://honorlock.com/studentprivacy/#faq.

Other requirements include:

- A webcam
- A microphone
- Your ASU Sun Card or any government-issued identification. **Important note:** <mark>Please do not use a bank card or MidFirst ID with any financial information for ID verification. Also, don't use a federal military ID either.</mark>

2. Do not log out or click on the Back button while taking the test.

3. While taking the test, do not open other browser windows or tabs.

4. If you ignore these rules or simply fail to take the test during the testing window without a documented medical or personal emergency, the instructor is under no obligation to give you a second chance, and if you are given a second chance, there may be a grade penalty, and/or you may be given a more difficult test.

5. Bathroom breaks during proctored tests are NOT permitted. Please plan ahead and go to the bathroom before you start your test.

6. Cell phones and any internet capable devices are not allowed during an exam, except for the computer you are taking the test on. Accessing any such device for any reason will result in a score of 0 for that exam and possible further disciplinary action.

7. You are not allowed to use notes of any kind on the exams, nor can you take pictures of your exams, save them, etc. OTHER THAN THE REQUIRED WEBCAM, YOU CANNOT USE ANY CAMERAS ON THE TESTS. You can't use a camera or software device to take screenshots of your test, or record your test by other means, such as using the browser's function to save the page. Attempting to record your test is considered cheating and grounds for academic dishonesty proceedings.

8. If your webcam is not easily movable, please have a mirror ready to show your test taking room to the camera.

9. You cannot wear headphones/earbuds/headsets while taking exams. Please don't wear hats or hoodies that make it impossible to see that you are not wearing earbuds and such.

10. You are expected to be alone in the testing room and not talk to anyone else or yourself while taking the test.

11. You can only submit your test answers once. Once submitted, your answers are final.

12. If you get disconnected from the internet during test taking, log back into the test using the same procedure you used to log in in the first place.

13. **Place your laptop or webcam at a certain distance from you while you are taking tests so that the camera shows not just your face, but your hands and work area.**

14. When you are done with your exams, please hold your scratch paper up to the camera, sufficiently close so the contents are legible.

Official ASU Online Proctoring Statement:

Students in face-to-face or online courses taking exams and quizzes at Arizona State University should expect to be proctored. The process includes verifying the identity of the student and providing either live proctors or other forms of proctoring during the exam or quiz. In the case of face-to-face courses, students can be required to show a valid identification card, and expect to be monitored by proctors while taking either an exam or quiz. Proctoring of online students requires presenting a valid picture identification card as part of the verification process and monitoring by online proctoring software. ASU contracts with three online proctoring software companies. Each company has been carefully reviewed for software security and the protection of student data and must meet the standards of the ASU Internet Security Office. In addition, any company employee, including proctors, who would have access to student data must have a background check and be finger printed. Students can take exams in any location that has a reliable Internet connection. It is best to select a quiet location where the student can be alone in a room.

ASU Online Course Policies

ASU has a set of general policies that apply to all online courses: [ASU Online Course Policies](#).

Preferred Names and Pronouns Policy

The School of Mathematical and Statistical Sciences encourages faculty to address and refer to students by their preferred name and gender pronoun. If your preferred name is different than what appears on the class roster, or you would like to be addressed using a specific pronoun, please let your instructor know.

Online Course Policy

This is an online course. There are no face-to-face meetings. You can log into your course via MyASU or https://my.asu.edu.

Email and Internet

ASU email is an [official means of communication](#) among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.

All instructor correspondence will be sent to your ASU email account, and it is expected that you contact the instructor only from your ASU email account. If you send email from any other account, the instructor may ignore the email.

Course Time Commitment

This three-credit course requires approximately 135 total hours of work. This time commitment is expected of all students in the class, including those who work full time and/or have families.

Late or Missed Assignments

Course credit is generally earned for *timely* completion of assignments. Grades reflect your performance on assignments as well as adherence to deadlines. That is why published assignment due dates (Arizona Mountain Standard time) are firm and submitting work late is unacceptable as a general rule.

The only cause for exceptions to this policy are personal emergencies that occurred through no fault of your own.

Notify the instructor **BEFORE** an assignment is due if an urgent situation arises and the assignment will not be submitted on time.

Please follow the appropriate University policies to request an accommodation for religious practices or to accommodate a missed assignment due to University-sanctioned activities.

Submitting Assignments

All assignments, unless otherwise announced, MUST be submitted to the designated area of Canvas. Do not submit an assignment via email.

Final Exam Make-up Policy:

The final exam schedule listed in the Schedule of Classes will be strictly followed. Exceptions to the schedule and requests for make-up examinations can be granted only by the following reasons:
1. Religious conflict (e.g., the student celebrates the Sabbath on Saturday)
2. The student has more than three exams scheduled on the same day as the final for this class
3. There is a time conflict between the final for this class and another final exam.

Early Examination Requests (Reference: ACD 304–01)

The following section reproduces an official university policy. It is beyond the power of the instructor to alter or waive.

Requests for early final examinations may not be granted by instructors. Requests that seem to have merit may be referred to the dean of the college in which the student is enrolled. If the dean

finds that a student must leave early because of circumstances beyond the student's control, the dean may authorize arrangements whereby the student can complete the course work and take the final examination before leaving. Ordinarily, however, it will be necessary for the dean to advise the student to clear with each instructor and arrange for an "incomplete" grade in each course. Under the policy covering "incompletes," the student must arrange to complete the course work and take the final examination within one calendar year. If the student is unable to return to the university to take a final examination for the removal of the "incomplete," the dean may make arrangements for the student to take the final elsewhere, under reliable supervision.

Drop and Add Dates/Withdrawals, Administrative Drop, Incomplete

This course adheres to a compressed schedule and may be part of a sequenced program, therefore, there is a limited timeline to drop or add the course. Consult with your advisor and notify your instructor to add or drop this course. If you are considering a withdrawal, review the following ASU documents: Drop/Add and Withdrawal, Withdrawal from Classes, Medical/Compassionate Withdrawal, and a Grade of Incomplete.

The incomplete is not a "get out of jail free" card. It cannot be used to buy you more study time if you are failing the class or to repeat a course for free. It can only be used "when a student doing acceptable work is unable to complete a course because of illness or other conditions beyond the student's control. "

The instructor reserves the right to have students who meet certain conditions administratively dropped from the class. The following conditions qualify you for administrative removal from the class:

- no activity on Canvas by 11:59pm, or having missed all for-credit assignments that are due or past due at 11:59pm
  - on the last day of the first week of class in a 15-week session
  - on the second day after the last day of the drop-add period in a summer or A/B session.

Failing grades (The E, EN and EU grades)

- The **E** grade is for students who participated in the class but did not earn enough credit to pass or attain the D grade.
- The **EN** grade is for students who never once participated in the class. At the instructor's discretion, any student who has not attended class during the first week of classes may be administratively dropped from the course. However, students should be aware that non-attendance will NOT automatically result in being dropped from the course. Thus, a student should not assume they are no longer registered for a course simply because they did not attend class during the first week. It is the student's responsibility to be aware of their registration status.
- The **EU** grade is for students who participated, but then stopped after a certain point and never resumed.

The Grade of Y

There is no grade of Y offered in this class.

Grade Appeals

Grade disputes must first be addressed by discussing the situation with the instructor. If the dispute is not resolved with the instructor, the student may appeal to the department chair per the [University Policy for Student Appeal Procedures on Grades](#).

Student Conduct and Academic Integrity

Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see http://provost.asu.edu/academicintegrity. Additionally, required behavior standards are listed in the [Student Code of Conduct and Student Disciplinary Procedures](#), [Computer, Internet, and Electronic Communications policy](#), and outlined by the [Office of Student Rights & Responsibilities](#). Anyone in violation of these policies is subject to sanctions.

Any (parts of) exams, assignments, reports, or solutions to these, from current or previous semesters, posted to any website not affiliated with ASU will result in academic integrity disciplinary actions against the students posting them and the students using them.

Asking for a higher grade than the one you have earned because you need a higher grade to maintain a scholarship, or to satisfy your own or someone else's expectations is a form of academic dishonesty.

[Students are entitled to receive instruction free from interference](#) by other members of the class. An instructor may withdraw a student from the course when the student's behavior disrupts the educational process per [Instructor Withdrawal of a Student for Disruptive Classroom Behavior](#).

Appropriate online behavior (also known as *netiquette*) is defined by the instructor and includes keeping course discussion posts focused on the assigned topics. Students must maintain a cordial atmosphere and use tact in expressing differences of opinion. Inappropriate discussion board posts may be deleted by the instructor.

The Office of Student Rights and Responsibilities accepts [incident reports](#) from students, faculty, staff, or other persons who believe that a student or a student organization may have violated the Student Code of Conduct.

The next paragraph clarifies what is considered appropriate behavior.

Expectations of Students an Online Course

- Students will abide by the rules and the timelines that are explained in the course syllabus.
- Students will not engage in dishonest practices such as hiring outsiders to do work or sit in for exams, with penalties up to and including expulsion from the university.
- Students need to understand that " online " does not mean "unproctored", and that at least half of the grade comes from proctored assessments.
- When working on unproctored components of the course, they are bound by the same ethical rules of behavior regarding the use of unauthorized assistance.
- Students understand that they must purchase all required items as described in the syllabus.
- Students understand that the course's timeline has certain assessments set for certain dates so as to maintain integrity for the course. Therefore, they cannot take exams or other proctored assessments early.
- Students understand that the content on the Course Shell (videos, powerpoints, etc.) is meant to help them develop conceptual understanding, and not necessarily meant to walk them step-by-step through every conceivable example. Related to this, students understand there will be homework problems that may not "look like" what was shown in the videos. It is expected that they will use this conceptual knowledge to determine a solution to such problems.

Regarding the instructor:

- Students understand that their instructor cannot answer all emails instantaneously. He or she may set aside a couple of hours per day to monitor emails, but to expect 24-hour service, 7 days a week is not reasonable.
- Students will not send aggressive, provocative, abusive, vulgar or profane emails to their instructor or to fellow students in any forum related to this course, for any reason or circumstance. Students understand that violating this rule may have consequences from immediate withdrawal from the course to more severe sanctions at the university to an including removal from my course of study or expulsion
- Students who perceive course policies or due dates as unclear or contradictory should make a Discussions post on that subject immediately and ask for clarification from the instructor. Perceived or apparent ambiguity, lack of clarity or contradiction does not entitle students to be exempt from course policies or due dates, or to select whichever interpretation applies to them, or to receive test makeups or retakes.

Regarding Online Homework Systems:

- Students understand that they must pursue the homework in an online course as they would in a face-to-face course, meaning that they must engage with the material by watching the videos, taking notes, and working out problems on sheets of paper.
- Students agree not to "randomly guess" answers and/or and email their instructor over and over again when they don't get the right answer. Guessing should not be an integral

part of this course. Homework related questions should be posted on Discussions, not emailed to the instructor.

- Ultimately, students understand that an online course demands the exact same dedication as would be expended for a face-to-face course. Students will set aside regular time to attend to their studies in an online course, and play by the exact same rules and expectations. Online is not "easier" - students should not abuse the online environment simply because there is no one watching them.

Prohibition of Commercial Note Taking Services

In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's communications in the form of notes. Notes must have the notetaker's name as well as the instructor's name, the course number, and the date.

You are not permitted to upload course materials to third party websites. This includes third party sites that sell those materials, and third party sites that make them available for free.

Course Evaluation

Students are expected to complete the course evaluation. The feedback provides valuable information to the instructor and the college and is used to improve student learning. Students are notified when the online evaluation form is available.

Participation Verification for students on financial aid

Students who receive financial aid and need to maintain minimum GPAs and/or completition rates should be aware that since there is no physical class attendance in an online class, online instructors will certify last days attended/participated based on verifiable participation only, such as submitted assignments, exams taken, participation in Discussions, or communicating with the instructor by email. Instructors cannot verify attendance or participation based on your assurances that you watched videos, read powerpoints, etc.

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Please remember to check your ASU email and the course site often.

Accessibility Statement

In compliance with the Rehabilitation Act of 1973, Section 504, and the Americans with Disabilities Act as amended (ADAAA) of 2008, professional disability specialists and support staff at the Disability Resource Center (DRC) facilitate a comprehensive range of academic support services and accommodations for qualified students with disabilities.

[Qualified students with disabilities may be eligible to receive academic support services and accommodations](). Eligibility is based on qualifying disability documentation and assessment of individual need. Students who believe they have a current and essential need for disability accommodations are [responsible for requesting accommodations and providing qualifying documentation]() to the DRC. Every effort is made to provide reasonable accommodations for qualified students with disabilities.

Qualified students who wish to request an accommodation for a disability should call (480) 965-1234 or email DRC@asu.edu.

Title IX policy:

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish to discuss any concerns confidentially and privately.

Computer Requirements

This course requires a computer with Internet access and the following:

- Web browser (Chrome)
- Webcam (for Honorlock proctored exams)
- Word Processor (for written homework)

It is your responsibility to verify that your hardware and software is operational before you take tests.

Technical Support

This course uses Canvas to deliver content. It can be accessed through MyASU at http//my.asu.edu or the Canvas home page at https://myasucourses.asu.edu.

To monitor the status of campus networks and services, visit the System Health Portal at http://syshealth.asu.edu/.

To contact the help desk call toll-free at 1-855-278-5080.

Do not contact technical support if you cannot access Webwork.

Ethernet vs Wifi

You may want to set your test taking device up with a wired (i.e. ethernet) connection since wired connections are more reliable, especially in spectrum-crowded urban locations.

Unicode Requirements

Please make sure that the device and browser you are using to access the class displays unicode math symbols correctly. A lot of quiz and exam questions incorporate them.

For your convenience, here is a selection of unicode math symbols:

logic: ⊢ ⊥ ¬ ∀ ∃ → ↔ ≡ ⊕ ↦
arithmetic: ÷ · × √ ∛ ∜ ± ∏ ⊔ ↑ ⋆ ∘ ⊔ ⌈ ⌉
comparison: ≠ ≤ ≥ ≃ ≅
simple fractions: ½ ⅓ ⅔ ¼
sets and set related: ∅ ℕ ℤ ℚ ℝ ℂ ∈ ∉ ∩ ∪ ⊂ ⊃ ⊆ ⊇
subscripts: $_0$ $_1$ $_2$ $_3$ $_4$ $_5$ $_6$ $_7$ $_8$ $_9$ $_+$ $_-$ $_=$ $_($ $_)$ $_a$ $_e$ $_o$ $_x$ $_h$ $_k$ $_l$ $_m$ $_n$ $_p$ $_s$ $_t$
superscripts: ^{0} ^{1} ^{2} ^{3} ^{4} ^{5} ^{6} ^{7} ^{8} ^{9} $^+$ $^-$ $^=$ $^($ $^)$ $_n$ ^{i} ^{x} ^{a} ^{b} ^{c} ^{d} ^{e} ^{f} ^{g} ^{h}^{i}^{j} ^{k} ^{l} ^{m} ^{n} ^{o} ^{p} ^{r} ^{s} ^{u} ^{v} ^{w} ^{x} ^{y} ^{z}
lowercase greek letters: α β γ δ ε ζ η θ ι κ λ μ ν ξ ο π ρ ς τ υ φ χ ψ ω
uppercase greek letters: Α Β Γ Δ Ε Ζ Η Θ Ι Κ Λ Μ Ν Ξ Ο Π Ρ Σ Τ Υ Φ Χ Ψ Ω
calculus: ∫ ∞
geometry: □ Δ ○

Stacked symbols, such as sigma sums which have symbols above and below the central sigma, cannot be satisfactorily typeset using unicode. Please typset those symbols using your word processor's equation editor or Latex math.

If you see empty boxes rendered above, your device or software is missing or not using a unicode font that contains these math symbols. If you experience this problem, try installing / switching to DejaVu or Droid fonts.

MacOS has known problems with certain unicode subscripts. In particular, the subscript letters h, k, l, m, n, p, s, t will not display correctly out of the box on macOS devices. To fix this, follow these steps:

- Install the Symbola font.
- Verify the Symbola font is enabled. Do this by running the "Font Book" application (go to spotlight, search for "Font Book" and open it). On the left column, select "User", right click on the "Symbola" font and if "Enable Symbola Family" appears as an option, select it. Otherwise, it was automatically enabled by the installation.
- Use Firefox. Safari and Chrome do not render unicode subscripts as well as Firefox.

- Restart Firefox if necessary.

Instead of Symbola, you can try Quivira, another free unicode font.

Important Instructions

1. According to ASU policy, all online students are required to have an official photo on file with the University. If you do not have an official photo on file, please go to https://webapp4.asu.edu/cardservices to upload one. There is no charge for uploading the picture. The instructor may withhold exam grades for students who do not have a photo on file with the University.

2. The class requires daily work, starting from the first day of class. Starting a week late, or doing work on the weekends only, is unacceptable.

3. Due dates are like food expiration dates. Just like an expiration date is not a recommendation to delay consuming the food until that date, due dates are not the dates on which your instructor wants you to or recommends that you work the assignments. They are merely the latest dates by which you are allowed to finish assignments. Reading assignments should all be completed before you start the for-credit assignments of the same week, and all for credit assignments should be finished well before the due date.

If you rely on completing significant portions of for credit assignments on the due date, you risk not being able to get timely help if you run into difficulties. Discussions help is not instantaneous and may require several rounds of exchange between yourself, other students and the teacher. Additionally, help does not mean that someone else will do your thinking for you. It will come in the form of hints that help you understand the problem and stimulate your own thought process, rather than supply you with copy-ready solutions.

Failure to respect this process and the difficulty of some of the assignments may cause you much unnecessary frustration with homework. Don't do this to yourself. Make a habit of starting and completing all assignments early.

Sometimes, several assignments are due on the same day. If you find yourself struggling to complete several different assignments on the day of the due date, and are getting upset with what you think is the teacher's poor planning, you are not considering that the due date was never meant to be the day when you do all this work.

All webwork and written homework being due at the end of each week is not an invitation to procrastinate. It's the teacher doing you a favor by not micromanaging your time, and respecting the time constraints of students with families and full time jobs.

4. Be aware of the difference between tutoring and academic dishonesty. If you're receiving help to help yourself - to write your own, substantially original solutions - it is tutoring. If you're copying other people's solutions in part or in full, whether a tutor or someone else that is not you wrote them, it's cheating.

Likewise, a copy and paste job from Discussions, verbatim or with some word or phrase substitutions, is plagiarism.

Trivial alterations to phrasing, i.e. alterations that even someone who doesn't understand the math could make, do not make a copied solution original. You can use what is posted on Discussions as a guide to writing your own solutions, but this means that after reading and understanding what other students posted, you put that away, and then develop your own solution, in your own words.

Here's a test: if the writing of your own solution requires you to go back and forth between your word processor and someone else's solution, then you are most likely not writing your own solution, but engaging in plagiarism.

FAQ

I need to download the course videos. How do I do that?

Try this: on Firefox, press ctrl-i in a page containing videos to bring up the **View Page Info** window. Then go to the **Media** tab. You will see a list of pictures and videos embedded in the page. Find and click on videos and do **Save As**.

Downloading the course videos is not a bad idea because it allows you to watch them if you find yourself in a situation without (a good) internet connection.

Some of the Quizzes are too hard! I'm fearing for my grade.

Some of them are indeed intentionally challenging. They are designed to give you an honest assessment of your understanding of the concepts and your ability to use them independently in applications. They are to guide you to what needs to be studied and reviewed in more depth.

There is no reason to panic over bad quiz grades. The quizzes are collectively worth only 2% of your grade.

When should I take the quizzes?

At the very least, you should have studied the corresponding lecture material thoroughly first. It is also good to work some of the Webwork problems first, because they give you multiple or even unlimited retries. Remember, the quizzes are mainly meant to be diagnostic, so you should not take them too early in your study process.

The written homework is too hard. I have to figure out too much on my own. I don't get the information I need from lecture and examples.

It is true that some of the written homework problems are more challenging than the kind of mostly mechanical homework problems you get in college algebra or calculus. That is because they are meant to provide an opportunity to learn mathematical reasoning, which is one of the

learning goals of MAT 243 (it's in the official course description). Mathematical reasoning can only be learned by doing the reasoning. The *information* you need is all there in the lectures, but it's your job to connect the dots and see how the information applies to the homework problem. A homework problem that is identical to a lecture example except for a few minor changes does not challenge you to practice your reasoning skills.

Again, there is no reason to panic over this. Written homework is only worth 3% of your total grade.

Why are the extra pages in the expanded powerpoints not in the filmed lecture videos?

They were added after the lecture videos were filmed in response to difficulties some students experienced with the homework. By and large, the content of the extra pages is not lecture material, i.e. not basic theory, but rather, understandings and connections you can and are expected to make on your own while you watch the filmed material and work through the written homework assignments. The pages exist as a safety net, in case you didn't make those connections on your own.

Do not think of the additional pages as extra lecture material you have to learn without the benefit of videos. Think of them as your questions anticipated and already answered in detail.

Having videos and then expanded powerpoints is really no different than having an in-person lecture plus a textbook. The textbook does not contradict what is said in the lecture. It just expands on it, goes into more detail, covers additional questions, etc.

Can you recommend additional resources?

This question is sometimes asked by students who are not using the resources they already have effectively: the textbook, the course videos, powerpoints, extra examples (videos and powerpoints) and Discussions. If some topic does not make sense to you, even though you read the corresponding section in the textbook, watched the course video, reviewed the powerpoint and looked at the extra examples, it is unlikely that a different textbook, another video, etc. will make a difference.

It is better in this situation to ask questions on Discussions.

The teachers are aware that the specific additional resource that students who ask this question often have in mind is a fully worked out model problem that is identical to a challenging homework problem, except that a few numbers have been changed. Many homework assignments are indeed of this type, but not all. This is intentional, as routine problems that come down to symbol substitution cannot develop mathematical reasoning skill.

If there is no model problem, ask for help on discussions and do not take an initial hint posted by the teacher as the last word, but rather, as the first post in a conversation. It's up to you to keep this conversation going.

Why are quizzes, written homework and webwork worth so little? I feel like I'm working for nothing.

Giving most course credit for proctored assessments is the only way to protect the integrity of the course. That does not mean though that your work on the unproctored assessment is for nothing.

Homework (quizzes, written homework and webwork) is where most of your learning will happen. Completing homework conscientiously and with a mindset of active engagement is what enables you to pass the exams. The inverse of that is usually also true: not doing homework leads to failing grades on the exams.

On the homework, you earn the currency of mastery of the material. The exams are just a device for exchanging that currency into course credit. Course credit earned on exams thus also rewards you for your homework.

Can't the graders leave more detailed feedback for written homework?

It would indeed be desirable if graders could leave extremely detailed feedback and basically comment on every sentence or equation you wrote. Unfortunately, this is not possible because graders are not paid for the number of hours that would be required.

Why am not receiving any feedback on written homework?

Graders are instructed to leave feedback when they take away points. Canvas supports two types of feedback: (1) comments left in a text box, and (2) annotations put directly into the pdf file. Graders are encouraged to use the second type, because it supports highlighting to show where exactly a mistake occurred.

Annotations are not shown in your Grades page. The little comment symbol next to the assignment will only show you (1). You need to click on the homework and then click on "view feedback" to see (2).

Is Discussion Participation Required?

It is not required, but expected. If you earn failing grades on assignments, and do not participate in discussions, your non-participation in discussions may be mentioned in an academic warning. Failure to participate in discussions has no direct consequence on your final grade, but it may have a large indirect, cumulative impact on all your grade components, in the form of you not benefiting from the learning opportunities that discussions offer.

If you are a very strong student, consider that by explaining problems to others, you will practice the important ability to communicate mathematical ideas. This skill is valuable not just for those who wish to go into teaching, but for all STEM workers, including those working in corporate environments.

How are multiple answer questions scored on Canvas exams or quizzes?

To calculate scores for Multiple Answers quiz questions, Canvas divides the total points possible by the amount of correct answers for that question. This amount is awarded for every correct answer selected and deducted for every incorrect answer selected.

I don't understand how extra credit on the exams works. I just took test 1 and got 84 points. What is my grade on test 1?

The instructor will post test grades that take extra credit into account after the testing period is over.

On test 1, there are 92 points and 8 extra credit points. 84 points is a grade of 84/92, or about 89%.

Why has my academic status report not been updated?

Academic status reports are not live tallies of your class performance and can't be updated. They are snapshots of your class performance on the specific date they were issued and will continue to show only what your performance was as of that specific date. The teacher may or may not issue new status reports. You can always see in your Canvas grade center and on Webwork what grades you have earned so far.

What is my current grade in the class?

The concept of a current grade in the class while grade components are missing is not as straightforward as you may think. The weights in this syllabus define a final grade, but they do not define partial grades.

Say you just took test 1 and want to know your current grade. You got a grade on quizzes and homework taken so far. All quizzes and homework are worth 10% of your final grade. Test 1 is worth 20%. Thus, less than 30% of your final grade components are represented, or exactly 30% if we assume that your quizzes/homework so far are representative for all the missing ones. We could now take the weighted average with a total weight of 30%:

current grade = (0.1*(quiz/homework grade) + 0.2 * (Test 1 Grade)) / 0.3.

The problem with that is that it gives undue weight to the quiz/homework component. In this calculation, the quiz/homework component accounts for 1/3 of your total, even though it will only be worth 10% of your final grade.

To fix the relative weights, we could just weigh Test 1 at 90%, which is equivalent to the not totally unreasonable assumption that your test 1 grade is how you will perform on average on all exams. Then

current grade = 0.1*(quiz/homework grade) + 0.9 * (Test 1 Grade).

This estimate is more plausible, but it's still an attempt to calculate something that is intrinsically unknowable because sufficient data does not exist to compute it. Some students do badly on a first test and then improve dramatically on subsequent tests. For others, it's the opposite: a great first test followed by worse and worse performance on subsequent ones. Yet other students perform consistently.

No math can predict which of these types - if any - you will be.

There is a third way of computing your "current" grade: just assign zeros to all assignments/test grades that you have not yet turned in/have yet to receive. This concept of current grade would assign failing grades to almost all students until the final exam has been written. You may think this is unreasonable, but it is meaningful in a way. It represents the grade you would receive for the class if you stopped working altogether at this point.

You can see the fundamental problem with the concept of a current grade: it depends on arbitrary assumptions about future events that are unknowable. So it's really pseudoscience. It's somewhat like poll numbers for an election that is still months away.

Instead of asking for a questionable number, make some reasonable inferences yourself. Are your exam grades all well above 60%? Then you are likely to pass the class if you maintain your current work habits. Are your exam grades consistently much below 60%? Then you are at high risk of failing the class, and almost certain to fail if you maintain your present level of commitment.

If you insist on wanting a numerical prediction of your final grade, just take your exam average. Given that exams account for 90% of the final grade, this is a somewhat plausible estimate, especially if you have been doing your homework decently so it neither adds nor subtracts much from your final grade.

Have you not been doing your homework at all? That will cost you a letter grade in the final grade calculation.

Use your own common sense, and don't fall for the tempting fallacy of "current grades" that come with a magical air of predictive power by being computed to 2 decimal places.

I worked with a math tutor but even the tutor could not help me. Can you help me with these problems?

Solid conceptual understanding of discrete math topics is not as common among math tutors as are procedural skills in college algebra and calculus. Working with a tutor whose knowledge of discrete math is weak, not receiving good help and then asking for Discussions help after all is not as good a use of your time as asking on Discussions in the first place.

Ask questions on Discussions, and be prepared to engage in a conversation. You may not just be told what the answer is, the way a tutor might. The teacher may respond to your question with more questions rather than answers. This can be frustrating, but if you give the process a chance,

it is likely to result in you having a genuine aha-moment and understanding a concept that was previously eluding you. Being told what the answer is will not result in the same learning experience.