



Precalculus Syllabus

(Version 1/24/2020)

Required Resources

- (1) Course website on Canvas, our electronic learning management (ELMS). Log in at <https://www.elms.umd.edu/> using your UMD directory ID and password.
- (2) One of the forms of the textbook and access to WebAssign (WA) homework system :Precalculus (Mathematics for Calculus) by Stewart, Redlin, Watson 7th edition WITH WebAssign access.



ISBN: 978-1-305-701618 (printed textbook and access to WA)
OR (buy only one!)

ISBN: 978-1-285-858333 (electronic format of the textbook and access to WA; no printed materials).

Learning Outcomes

This course is the sole pre-requisite for MATH140 and MATH 135. It can serve as the pre-requisite course for MATH120 (MATH113 is the alternative, single contact course). If your major lists MATH115 as one of many courses satisfying their math requirements, consider the alternatives.

We will study elementary functions and graphs (polynomials, rational functions, exponential and logarithmic functions, trigonometric functions) and algebraic techniques for calculus. There will be some new content in chapters 2 and 5, but you will have seen most of the content in a previous math course. Therefore the focus of the course is on algebraic and learning techniques preparatory to calculus as it is taught at University of Maryland, especially for the MATH140 course.

As a first year course, MATH115 has goals expressed in terms of content ('what'), mathematical practice ('how') and mindset ('Through my work, I am improving every day').

CONTENT: After successfully completing this course you will be able to:

- 1) Use algebraic techniques to identify the domain and range of a function, perform basic operations on functions, and find and interpret the average rate of change of a function.
- 2) Graph a one variable function given its equation by identifying key features of the graph or by applying transformations to a parent function.
- 3) Compare algebraic and geometric representations of functions. For example, (i) Evaluate the algebraically derived domain, range and average rate of change against the graph of the function; (ii) identify the type of a function based on its graph (iii) model algebraically the graph of a function by writing an equation for the function graphed.
- 4) Solve equations and inequalities involving the functions studied in the course. In particular, solve polynomial and rational inequalities using the table of signs method.
- 5) Use exponential laws, logarithmic laws, and basic trigonometric identities to simplify expressions.

MATH115

Spring 2020

Dr. Raluca ROSCA

math115@umd.edu

Lecture:

MWF 9-9:50 am

ESJ 2208

Office Hours

MTH (Kirwan) 2303

MW 3:30 -5 pm, F2-3pm
and by appointment

Discussion(fill yours):

Section number: _____

Day/time: _____

TA and Contact for TA:

Prerequisites

Math eligibility of
MATH115 or higher

Course Communication

ELMS/Canvas serves as the main announcement tool for the course. If you are trying to contact your professor or TAs, please use the course email math115@umd.edu. We will answer in less than 24 hours during the workweek and less than 3 days over the week-end. If you write us via ELMS, you will receive no answer except an automatic redirecting email. Professional emails get quicker, better results – see ter.ps/email and ter.ps/EmailHowTo).

Mathematical Practice: Students will engage with the content through the use of the Standards for Mathematical Practice:

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Growth Mindset: Students will develop an appreciation for the importance of a growth mindset in learning mathematics.

Students with a growth mindset believe that intelligence and “smartness” can be learned and that the brain can grow from reflective practice. In contrast, students with a fixed mindset believe that you are either smart or you are not. The implications of this mindset are profound -- students with a growth mindset work and learn more effectively, displaying a desire for challenge and resilience in the face of failure. In contrast, when students with a fixed mindset fail or make a mistake, they believe that they are just not smart and give up. Such students frequently avoid challenge, preferring instead to complete easier work on which they know they will succeed. (after Carol Dweck, ‘Mindset’)

Software Used

Throughout the course, we will be using the following software, in addition to ELMS/CANVAS:

- WebAssign (WA) – for homework; access to it is free until February 2nd; and paid afterwards (as listed on the first page). If you are retaking the course and have bought WA access for MATH115 before, it should carry to this semester; please email dr. Rosca (math115@umd.edu) with any problems.
- Piazza – for asking math questions that might be of interest to others in the class as well. This free forum software allows you to post under your name or anonymously, to differentiate between your instructor/TA answers and your classmates answer, to write beautiful math and tag questions.

The WA and Piazza spaces for the semester are linked to the course page in ELMS/CANVAS.

We will also use Desmos (<https://www.desmos.com/>) to generate and explore graphs throughout the semester, links will be provided.

Campus Policies

It is our shared responsibility to know and abide by the University of Maryland’s policies that relate to all courses, which include topics like:

- | | |
|------------------------------------|---------------------------------------|
| • Academic integrity | • Attendance and excused absences |
| • Student and instructor conduct | • Grades and appeals |
| • Accessibility and accommodations | • Copyright and intellectual property |

Please visit www.ugst.umd.edu/courserelatedpolicies.html for the Office of Undergraduate Studies’ full list of campus-wide policies and follow up with me if you have questions.

In particular, if you have a documented learning disability or a physical handicap and need additional time or accommodations for your coursework, you need to register **ASAP** with Accessibility and Disability Support Service (ADS) in the Shoemaker building and schedule an appointment with Dr. Rosca to discuss your accommodations. See more at <https://www.counseling.umd.edu/ads/start/>

Activities, Learning Assessments, & Expectations for Students

The average time spent on non-examination studying for a math course at this level should be about 1.5-2 hours for every hour spent in class; in other words **you should plan to spend an average of 9-12 hours a week outside class on reading the textbook, practicing examples and problems, working on homework assignments, reviewing class notes and returned assignments, and studying for quizzes.** This is *in addition* to time actively spent in lecture and discussions (6 hours/week). **Please plan your schedule accordingly.** Mathematics topics build heavily on earlier concepts and it is hard to catch-up if you fall behind, so **do your work, everyday.**

Math 115 has two types of classes, (i) lectures and problem sessions with Dr. Rosca in ESJ 2208 and (ii) discussion sessions with your Teaching Assistant (TA), MWF or TuTh in PHY4207.

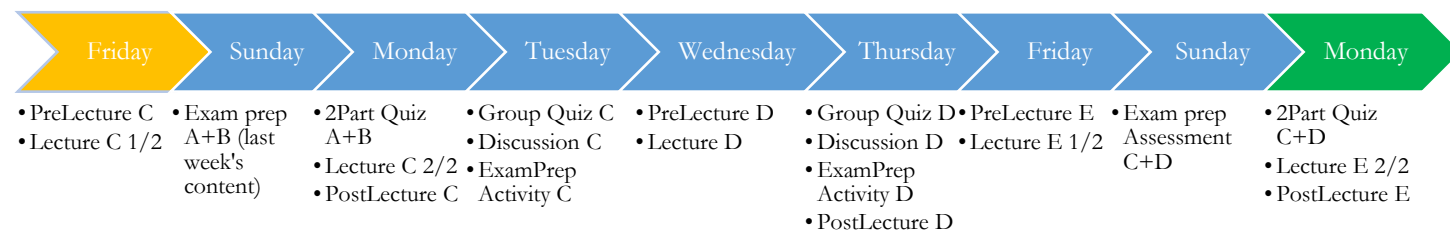
The work of this course is based on the learning principle of 'dispersed, reflective practice' (that is, we learn better and retain skills for longer when we learn and practice a skill throughout the week and the semester rather than in one big chunk of time of similar length). Much of this work is group work, as the effort necessary to communicate what we understand and what we do not when solving a problem is extremely helpful to our own learning. You will see also see this structure in the way the material is presented on the course website on ELMS.

The material of the course is organized in content chunks or 'lessons'. Groups of seven to nine lessons are assessed during three in-lecture **mid-term exams all on Friday in lecture at 9am (Exam 1 – Feb. 21; Exam 2- Mar.27, Exam 3 – Apr. 24).** Our comprehensive **final exam is on the first day of exam week, Th May 14, 1:30-3:30 pm, on a location TBD mid-semester.** **You can bring to these exams one 8.5x11 in. handwritten formula sheet (use both sides if needed) of your own making. There are no calculators on any of these exams.**

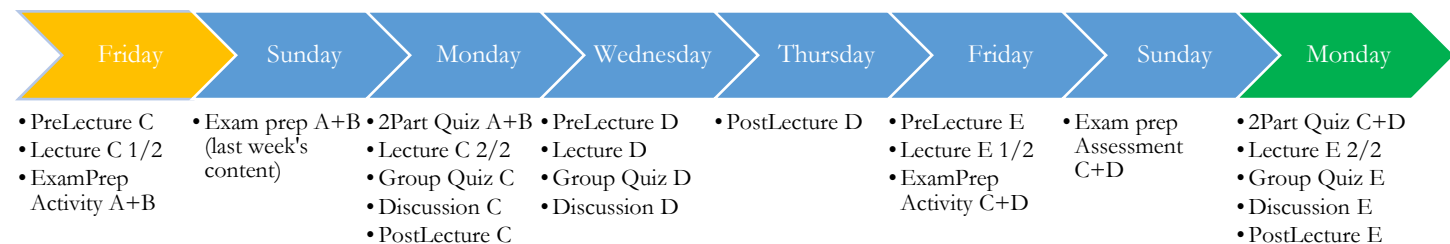
There is also an in-lecture algebra diagnostic test on **Monday Feb. 3**, scored out of 20 points.

Each lesson has associated with it a number of activities and assessments that happen at home, in lecture or in discussion: (i) a pre-lecture activity; (ii) a pre-lecture quiz; (iii) one or two lectures; (iv) a WA post-lecture assignment; (v) a group discussion quiz followed by a group exploration during your discussion, (vi) an exam-prep(ARATION) activity, (vii) an exam-prep assessment and (viii) a two-part exam-prep quiz. Most of the time of the course and 95% of the learning are happening when you are engaged in these activities; they are the perfect place to ask questions, make mistakes (and learn from them!).

For example, the usual non-exam week for a student in the TuTh discussion sections will look as follows:



While the usual non-exam week for a student in the MWF discussion sections will look as follows:



Here is a short description of each type of activity or assessment associated with a lesson. In general the activities are not graded, while the assessments or quizzes are graded.

- i) The **pre-lecture reading** consists of pages from the textbook with material students need to read **before class** as well as practice problems similar to an assigned textbook example to understand the lecture/problems/process to come. This activity is not graded but prepares you for the **pre-lecture quiz** and for the lecture.
- ii) The **pre-lecture quiz** is happening online before our lecture time (Wednesdays and Fridays) and is an accessible problem based on your assigned pre-lecture reading. It is usually due on ELMS/CANVAS as a quizz, but sometimes it will be due in lecture. Quizzes in ELMS/CANVAS are visible at least 24 hrs before they are due.
- iii) It is followed by more difficult problems and concepts presented during the **lecture(s)**, where your questions are needed and welcome. Following the lecture, you are expected to finish reading the assigned textbook sections, review your notes from lecture, and start working on your formula sheet.
- iv) You will then practice easy-to-medium problems in your **post-lecture assignment**, a homework-type assessment submitted individually in WebAssign (WA). If in doubt, ask questions using the 'Ask your professor' function in WA, via Piazza or during office hours.
- v) During your discussion classes, you will have a **group discussion quiz** (10-15 mins). The quizzes are graded and receive feedback not only on the correctness of an answer, but also in the way that the process of obtaining and checking an answer is presented. After quiz you will do, also in your small group, a guided discussion/ exploration of interesting problems from that particular lesson that will help you make connections among different pieces of content and different representations of functions.
- vi) For the **exam preparation** activity, you will work in your group through exam-prep questions either at the end of the discussion (for the TuTh discussion sections) or on Friday (for the MWF sections).
- vii) The **exam prep assessment** is an individual WebAssign homework due on Sundays at 10pm. The exam prep activity from discussion should make these harder problems do-able.
- viii) The two-part **exam prep quiz** takes place in lecture, usually on Mondays. It contains problems (or parts of problems) that could be on an exam. First you will work on the quiz by yourself for 5-10 minutes and turn your quiz for grading. Second, you will then get to re-do the quiz (or a part of it) in your small group and turn in one solution per group. If your individual grade is larger than your group solution grade, you keep your individual grade; otherwise your total quiz grade is a weighted average (75% individual grade, 25% your group grade). **No calculators but you can bring to the two-part quiz a 4x6 in formula sheet, handwritten.**

There is no make-up for lecture quizzes (pre-lecture or the two-part). Late submissions on Web-Assign are accepted with penalty (5% per day, up to 2 days). To account for the occasional family emergency, headache or computer meltdown, the 10% of assignments with the lowest grade will be dropped in each category except exams (that is for class quizzes, post-lecture assignment etc). See more details in the next section on how to proceed if you have a prolonged illness, a religious holiday or an athletic commitment – we are willing to help, but communication from your part is the key.

Course-Specific Policies

No computers, phones or tablet devices are permitted during our lecture meetings (except when required for ADS accommodations). I understand and have considered arguments for permitting laptop and tablet computers in the classroom. However, in my experience (and based on the research evidence) the reality is that they present an irresistible distraction and detract from the cooperative learning environment. Researchers have found that these distractions do in fact interfere with learning and active participation. For that reason, the use of computers and phones will not be permitted during lecture.

I expect you to make the responsible and respectful decision to refrain from using your cellphone in class. If you have critical communication to attend to, please excuse yourself and return when you are ready. For more information about the science behind the policy, watch: <http://youtu.be/WwPaw3Fx5Hk>

Groups will be formed by TA based on your discussion section. New groups will be reformed a number of times throughout the semester and you will have a chance to let us know with whom you would rather work or not work.

In the case of a 10 am delayed start on MWF, the large lecture will not meet in person, but a PANOPTO video recording will be provided, and dr. Rosca would be available for extended office hours later in the day/that week. If an exam was scheduled for 9am on such a day, it will get rescheduled for the next large lecture meeting time (so the Fri Febr 21 midterm would get reschedule for Mon Febr 24 etc). ELMS on-line pre-lecture quizzes will be due as usual.

If you miss an exam because of illness or a University sponsored activity, you should write to Dr. Rosca at math115@umd.edu as soon as possible (preferably in advance) and the validation for the absence should be presented on your first class day back. The university policy on absences or missed assignments is available at <http://www.ugst.umd.edu/courserelatedpolicies.html>

I will provide a make-up for an exam missed due to an excused absence (ASAP within a week from the initial exam date). As discussed above, I will not provide a make-up for a small assessment (quiz etc), but drop the lowest graded 10% of assignments from each non-exam category.

The “sunset provision.” We want you to succeed in this course (and in the future!), and one of the most important metrics for success is improvement. If your score improves from the first exam to the second, your score on the first exam will be replaced by the formula $(2 E1\% + E2\%)/3$ (or, equivalent, receives an improvement bonus of $(E2\% - E1\%)/3$). This policy applies to all exams and the diagnostic test, with your final exam score augmenting your third exam score. As an example, let's say PreCalculus Terp (a.k.a. PT) gets 12 (from 20) on the diagnostic quiz, 78 87 81 on the midterm exams, and a 171 on the final. The sunset provision increases PT's scores on the diagnostic quiz from 12 to $12 + 1.2 = 13.2$, on exam 1 from 78 to $78 + (87 - 78)/3 = 81$, and on exam 3 from 81 to $81 + 1.5 = 82.5$. The grades of 87 on midterm exam 2 and 171 and on the final exam are not modified. Studying throughout the semester pays off and so does getting better!

Names/Pronouns and Self Identifications

The University of Maryland recognizes the importance of a diverse student body, and we are committed to fostering equitable classroom environments. Many people might go in daily life by a name that is different from their legal name. In our classroom, we will respect our fellow Terps and refer to people using the names and personal pronouns that they share. Visit trans.umd.edu to learn more.

Get Some Help!

You are expected to take personal responsibility for your own learning. This includes acknowledging when your performance does not match your goals and doing something about it (work harder, work smarter and/or ask questions).



Office hours (listed on the first page) are times we (myself and our TAs) reserve for you to ask questions; please use them. Other free university resources are listed at <https://www-math.umd.edu/undergraduate/resources.html> and updates will be announced in ELMS during the second week of class.

Everyone can benefit from some expert guidance on time management, note taking, and exam preparation, so I encourage you to consider visiting <http://ter.ps/learn>. Finally, if you just need someone to talk to,

visit <http://www.counseling.umd.edu>. Everything is free to use because you have already paid for it with your tuition money, and **everyone needs help**... all you have to do is ask for it.

Grades

Grades are earned. Your grade is determined by your performance on the learning assessments in the course and is assigned individually (not curved). If earning a particular grade is important to you, please speak with me at the beginning of the semester so that I can offer some helpful suggestions for achieving your goal.

20 Algebra Diagnostic test
130 Pre-lecture, quizzes, and WebAssign (drop the 10% of assignments with the lowest grade in each category)
 20 Pre-lecture quiz
 25 Two-part quiz
 40 Discussion Group quiz
 20 WA post-lecture
 25 WA exam prep
300 Three exams of 100 points each
200 Final exam (cumulative)
Up to 5 bonus points obtained from asking thoughtful questions and answering
Up to 10 bonus points obtained from participating in learning surveys throughout the semester

650 Total *(The sunset provision above would be used to compute your total grade.)*

Final letter grades are assigned based on the **percentage** of total assessment points earned (for example 500 out of 650 points means 76.92%). To be fair to everyone I have to establish clear standards and apply them consistently, so please understand that being close to a cutoff is not the same as making the cut (89.99 is not 90.00). It would be unethical to make exceptions for some and not others.

Final Grade Cutoffs									
+	97.00%	+	87.00%	+	77.00%	+	67.00%		
A	94.00%	B	84.00%	C	74.00%	D	64.00%	F	<60.0%
-	90.00%	-	80.00%	-	70.00%	-	60.00%		

All assessment scores will be posted on the course ELMS page. There might be up to a week delay between when an assignment is completed and graded in WebAssign and when it is updated on ELMS. If you would like to review any of your grades (including the exams), or have questions about how something was scored, please email math115@umd.edu to schedule a time to meet with Dr. Rosca in her office.

I am happy to discuss any of your grades with you, and if we have made a mistake we will correct it. Any formal grade disputes must be submitted in writing and within one week of receiving the grade.

MATH115 PRECALCULUS TENTATIVE SCHEDULE –SPRING2020-- SEE ELMS for UPDATES

Week	DATE	What's Covered	Textbook Section
1	M 1.27	Syllabus; Review exponent laws, special product/factoring formulas; operations with rational expressions	1.1-1.4
	W 1.29	Lesson 01 - Equations (including quadratic type with substitution, radical equations)	1.5
	F 1.31	Lesson 02 - Table of Signs Linear and polynomial inequalities - Table of signs, interval notations	1.8
2	M 2.3	Algebra diagnostic test Lesson 03 - Union, Intersection of sets, Absolute Value Inequalities	1.1, 1.8
	W 2.5	Lesson 04 - Functions, Graphs, Transformations Transformations and Graphing, domains and range. Discuss in detail characteristics of a good graph: Square root (example of domain not all reals), Absolute value (example of piecewise function)	2.2, 2.3, 2.6
	F 2.7	Lesson 05 - Quadratic Functions (definition, Vertex form, Standard form, graph of a quadratic function via transformations or directly) Last day to adjust schedule (add/drop a class)	3.1
3	M 2.10	Two part quiz from lessons 1-4 More graphs. Word problems and detective problems.	3.1
	W 2.12	Lesson 06 - Polynomial Functions: Definition , graph end behavior, graph behavior near a root; Polynomial graph; detective problems	3.2
	F 2.14	Lesson 07 - Combining Functions Combining function (arithmetic operations, composition of functions) (Deadline for make-up Algebra diagnostic test)	2.7
4	M 2.17	Two part quiz from lessons 5-6 Combining Functions and review, attention to domains	2.7
	W 2.19	Review - start working through past exams	
	F 2.21	EXAM 1 - Lessons 01-07	
5	M 2.24	Lesson 08 - Rational Functions; Inequalities with rational functions	1.8, 3.6, 3.7
	W 2.26	Lesson 09 - Graphing Rational Functions	3.6
	F 2.28	Lesson 10 – Exponent rules, Exponential Functions	1.2, 4.1, 4.2

6	M 3.02	Two part Quiz from Lessons 8-9 Graphing exponentials directly and via transformations	4.1, 4.2
	W 3.04	Lesson 11 - Logarithmic Functions Definition and properties of logs; Exponential for	4.3
	F 3.06	Lesson 12 - Graphing Logarithmic Functions Log graphing and transformations; finding intercepts of graphs	4.3
7	M 3.09	Two part quiz- Lessons 10-11 Continue transformations and finding intercepts of graphs.	4.3
	W 3.11	Lesson 13 - Laws of Logarithms	4.4a
	F 3.13	Lesson 14 - Exponential and Logarithmic Equations	4.5
8		SPRING BREAK – NO CLASSES	BE SAFE
9	M 3.23	Review – especially using laws of logarithms to solve exponential and log equations	4.4b
	W 3.25	Review by working through sample exams	
	F 3.27	EXAM 2 - Lessons 08-14	
10	M 3.30	Lesson 15 - Right Triangle Trigonometry Right triangle trig, $s=r*\theta$ and velocity form, conversions between degrees and radians; Area formulas for triangle and circle sector	6.1, 6.2
	W 4.01	Lesson 16 - The Unit Circle, Trigonometric Functions Define Unit Circle and Terminal point. Connecting right triangle trig. to the unit circle;	5.1, 5.2
	F 4.03	Lesson 17 - Graphing Trigonometric Functions Graphing trig functions (sine, cosine); include shifts/stretch;	5.3, 5.4
11	M 4.06	Two part quiz- Lessons 15-16 L17: Graphing trig functions (tan/cot/sec/csc); include shifts/stretch;	5.3, 5.4
	W 4.08	Lesson 18 - Proving Trigonometric Identities (simplifying expressions and equalities involving sine, cosine, etc)	7.1
	F 4.10	Lesson 19 - Addition, Subtraction, Double Angle Identities (no half-angle formulas or sum-product formulas) Last day to withdraw with a W	7.2, 7.3
12	M 4.13	Two part quiz: Lesson 17-18 Continue proving and using trigonometric identities	7.2, 7.3

	W 4.15	Lesson 20 - Trigonometric Equations I (easy, plus $2\pi \cdot k$)	7.4
	F 4.17	Lesson 21 - Trigonometric Equations II (harder - start using identities, manipulating $2\pi \cdot k$)	7.5
13	M 4.20	Review (emphasize trig identities/simplifying)	
	W 4.22	Review	
	F 4.24	Exam 3 - Lessons 15-21	
14	M 4.27	Lesson 22 - Inverse Functions (review domain and range, composition of functions; solving equations)	2.8
	W 4.29	Lesson 23 - Trigonometric Substitution -Simplifying expressions using composition of functions, one trigonometric; Review trigonometric identities, absolute value, sign of trigonometric functions	7.1
	F 5.01	Lesson 24 - Average Rate of Change (Review operations with rational fractions)	2.4
15	M 5.04	Two part quiz: Lessons 22-23 Finish lesson 24	
	W 5.06	Review	
	F 5.08	Review	
16	M 5.11	Review	
	W 5.13	Reading Day – Q&A Session- Time and location TBD	
	Th 5.14	(1:30-3:30) Comprehensive FINAL EXAM - Lessons 01-24 LOCATION To Be Announced in April	