

MTH 111: Pre-Calculus (Summer 2017, Session I)

- Instructor:** Dr. Vasilije Perović
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Email Policy: The **only** address that should be used for communication is the one associated with your URI account.
Office: Lippitt Hall, 200B ☎ (401) 874-4463
Office Hours: **Mon/Wed 4:15pm – 5:30pm in Shepard Building 259;**
Tue 3pm - 6pm in Lippitt Hall 200B (Kingston Campus)
You may also see me at other times by arrangement.
- Classroom:** Shepard Building 445, Providence; Mon/Wed: 6:00pm – 9:45pm.
Class Website: This course will use **SAKAI** which should be checked regularly for announcements, grades, updates, lecture notes, etc! You might also find the following website helpful
http://math.uri.edu/~perovic/Teaching/Summer2017/MTH111_Sum17.html
- Prerequisite:** Passing the placement exam or getting C- in MTH 101 is **required**.
Textbook: M. Dugopolski, *Fundamentals of Pre-Calculus*, 2nd Edition, Pearson Publishing, 2009.
(Custom Edition for URI od Standard Edition). Any supplemental material will be posted on SAKAI.

Bring the textbook to each class, since we will refer to it frequently. It is essential to read the text regularly, and read material before we cover it in class!

Course Description: Equations of first and second degree, systems of equations. Inequalities. Functions and graphs. Exponential, logarithmic, and trigonometric functions. Applications. Introduction to analytic geometry. Complex numbers. Designed for students who need to strengthen their background in mathematics below calculus.

Course Objectives: The primary goal of MTH 111 is to prepare students for calculus (MTH131 or MTH141). The calculus sequence is often an essential step toward degree and career objectives, so MTH 111 is also such a step. Thus MTH 111 is aimed at the student for whom it will be the first of an important series of courses rather than a last math course. **The prerequisite requirement for MTH131 and MTH141 is earning a C- or better in MTH 111.**

Syllabus: We will cover *most* of the Chapters 1–4 in our textbook.

General Advice: This course demands a **very substantial** amount of hard work *especially during summer*. As a general rule of thumb, students are expected to spend on average 3 hours outside of class for every hour spent in class. Thus during the next five weeks you should plan on devoting for this class on average 25-30 hours per week beyond the class meeting time. You are also strongly encouraged to form study groups. Talking about mathematics, and critiquing each others' solutions are very effective ways to learn the subject.

Learning Outcomes: In order to succeed in this course and future math courses, you will need to demonstrate mastery of the 9 Precalculus Competency Areas (PCA). For details of the rubric elements, go to <http://web.uri.edu/generaleducationimplementation/rubrics/>. At the end of this course you will be able to:

- **PCA-1: Inequalities** – Solve and graph simple linear inequalities, compound inequalities, absolute value inequalities quadratic inequalities and rational inequalities.

Rubric Elements – A.1, A.2, B.2, STEM1, STEM2

- **PCA-2: Graphs and Graphing** – Find the distance between and midpoint of two points. Calculate and graph x -intercepts and y -intercepts. Graph horizontal and vertical lines. Identify families of functions and shifted graphs for linear, quadratic, cubic, square root, cubic root and greatest integer functions. Transform the graphs of linear, quadratic, cubic, square root and step functions by identifying the horizontal and vertical shifts, stretches, shrinkages, and reflections. Discern symmetry from a graph. Graph piecewise functions. Determine and notate increasing, decreasing and constant intervals.

Rubric Elements – A.2, A.2, B.1, C.3, STEM1, STEM2, STEM3, STEM4

- **PCA-3: Linear Equations and Lines** – Calculate and identify the slope of a line, slopes of parallel and perpendicular lines, and slopes of vertical and horizontal lines. Create the equation of a line given two points or given a point and a slope or the line parallel or perpendicular. Detect the slope of a line given the graph of the line.

Rubric Elements – A.1, A.2, B.1, B.2, STEM1, STEM2, STEM3

- **PCA-4: Functions** – Test whether a given relation is a function for sets, graphs and equations. Use function notation. Evaluate the value of a function. Explain piecewise functions. Perform basic operations with functions. Determine the domain and range of a function. Compute the difference quotient of a function. Compose two or more functions. Test whether a given function is even or odd algebraically. Explain how to determine one-to-one functions for sets, graphs and equations. Find the inverse of a given function. Verify inverse functions using composition. Find the inverse of a mathematical model.

Rubric Elements – A.1, A.2, B.1, B.2 C.1, C.2, C.3, STEM1, STEM2, STEM5, STEM6. STEM7

- **PCA-5: Polynomials** – Factor polynomials, expand/multiply polynomials. Convert from the standard quadratic form to the standard parabola form by completing the square. Find the vertex, axis of symmetry, and other properties of a parabola represented by given quadratic function. Perform basic operations on complex numbers. Solve quadratic equations with real and imaginary roots. Divide two polynomials by both the long division and synthetic division methods. Recognize and apply the Zero Factor Theorem. Interpret and apply the Remainder Theorem. Interpret and apply the Rational Roots Theorem. Interpret and apply Descartes’s Rule of Signs. Graph higher order polynomials. Determine the end behavior of a polynomial function using the Leading Coefficient Test. Find all roots of a higher order polynomial. Determine the behavior of a polynomial function at the x -intercepts. Create the polynomial given its roots (both real and complex). Understand and apply the Complex Conjugate Theorem. Graph higher order polynomial functions.

Rubric Elements – A.1, A.2, B.1, B.2, STEM1, STEM2, STEM5, STEM6

- **PCA-6: Radicals and Exponents** – Perform basic operations on radical expressions. Explain the domain of exponential functions. Graph exponential functions and the associated family of functions. Simplify exponential expressions. Transform between radical, fractional and exponential forms.

Rubric Elements – A.1, A.2, C.1, STEM1, STEM2, STEM5

- **PCA-7: Rational Expressions** – Identify the domain of a rational expression. Evaluate rational expressions. Determine the vertical and horizontal asymptotes. Graph rational equations including asymptotes and “holes”.

Rubric Elements – A.1, A.2, B.1, B.2, STEM1, STEM2, STEM5, STEM6

- **PCA-8: Trigonometric Functions** – Evaluate basic trigonometric functions. Convert angles to degrees or radians. Find the domain and the range of the trigonometric functions. Understand Sine and Cosine functions from unit circle. Memorize and recall the trigonometric values at important angles based on unit circle. Understand and identify the graphs of trigonometric functions. Calculate the values of all other trigonometric functions. Transform and graph Sine and Cosine functions including phase shifts, periodicity and amplitude. Determine the values and graph inverse trigonometric functions. Solve right triangles and use right triangle trigonometry to solve application problems involving angle of elevation and angle of depression. Memorize and recall the Pythagorean Identities, Odd and Even Identities, Sum and Difference Identities, Double-Angle Identities and Half-Angle Identities. Simplify trigonometric expressions and prove equivalent expressions using trigonometric identities.

Rubric Elements – A.1, A.2, B.1, C.1, C.2, STEM1, STEM2, STEM5, STEM6, STEM7

- **PCA-9: Logarithms** – Evaluate logarithms. Apply logarithmic rules to simplify an expression. Solve logarithmic equations. Solve exponential equations. Understand and apply the properties of exponential functions and logarithmic functions. Apply mathematical methods and properties of exponential and logarithmic functions to solve real world application problems of compound interest calculation and radioactive decay.

Rubric Elements – A.1, A.2, B.1, B.2, C.1, C.2, C.3, STEM1, STEM2, STEM3, STEM5, STEM6, STEM7

- **PCA-10: Problem Solving** – For all PCAs, justify solutions and the problem solving process. Verify, interpret and communicate solutions with respect to the original problem. C.2, C.3, STEM7

Computing: Graphing calculator is **not required or needed**. You are expected to solve all the problems without assistance of calculator.

Video Lectures/Notes: In case our class is canceled for any reason, I might post a link on SAKAI to a video lecture (resp., handout) that you will be responsible for watching (resp., reading).

Attendance: Regular, on-time attendance is expected! Attendance will be taken regularly. Should you miss class, your first step should be to get notes from a reliable fellow student. You are responsible for everything that goes on in each class, present or not, including any announcements about assignments, exams, due dates, etc.

Tutoring: Free tutoring is available to URI students during summer I at the following locations and times:

Campus Location	Room Number	Days	Time
Kingston	Lippitt Hall 201	Monday - Thursday	10am – 2pm
Providence	Shepard Building 443	Monday - Thursday	2pm – 6pm

Evaluation: The course grade will be based on **in-class work**, **3 in-class exams**, **online homework**, and the **final exam**, weighted as follows:

Homework (WebWork)	12.5%
In-Class Work	12.5%
3 In-Class Exams	45 % (3 @ 15 % each)
Final Exam	30 % (Wednesday, June 21, 6:00pm - 9:45pm)

Letter grades for the course will be determined by considering your overall weighted percentage according to the following scale:

A: 92.00% and above		A-: 90.00% – 91.99%
B+: 87.00% - 89.99%	B: 83.00% – 86.99%	B-: 80.00% – 82.99%
C+: 77.00% – 79.99%	C: 73.00% – 76.99%	C-: 70.00% – 72.99%
D+: 67.00% – 69.99%	D: 60.00% – 66.99%	
F: 59.99% and below		

Any questions or concerns regarding your course grade should be discussed well before the final exam. Once the final exam is administered, your grade is final and no makeups or extra credit will be offered. Additionally, incompletes will not be given to students who are dissatisfied with their grades at the end of the semester, and grades of NW will not be given to students who have completed even a single assignment.

Incomplete Grade: University of Rhode Island regulations concerning incomplete grades will be strictly followed (see University Manual sections [8.53.20](#) – [8.53.21](#) for details). Note that a student must be passing the course before an incomplete is even an option.

Exams: There will be three in-class exams and the cumulative final exam. The topics that will be covered on each of the exams will be announced in class. **Makeup exams** will be permitted *only* in those cases when a student documents a *genuine medical or personal emergency*. In such a case you must notify instructor of your emergency within 24 hours of the day of the exam. The tentative schedule for exams is as follows:

Exam 1: May 31 **Exam 2:** June 7 **Exam 3:** June 14 **Final Exam:** June 21

Three in-class exams will be split in roughly two equal parts: multiple choice questions and show your work. At least half of the final exam will consist of multiple choice questions.

WebWork Homework: Online homework is administered weekly using the free system WebWork. Your username is your URI student ID number, and your default password is the first eight letters of your last name (entered in lowercase). Ignore spaces and characters other than letters. Use your entire last name if it contains eight or less letters. The WebWork calendar is attached at the end of this document. Late submissions will not be accepted for any reason. **All questions about WebWork should be directed to mth111webwork@gmail.com.**

In-Class Work: During every class period there will be a worksheet that will need to be completed as a group. Additionally, on the days when there is no exam, there will be open book/notes in-class quizzes based entirely off suggested homework problems or previous lecture notes. Note that you will not be given a lot of time to complete these quizzes, so coming prepared to class is essential!

Important Dates: Please pay close attention to the following dates:

- May 29 (Monday)** – Memorial Day, **no classes**.
- June 2 (Friday)** – Monday classes meet!
- June 2 (Friday)** – Last day to DROP the course.
- June 21 (Wednesday)** – Last day of instruction *for this class* !

Accommodations: Any student with a documented disability (e.g., physical, learning, vision, hearing, etc.) who needs to arrange reasonable accommodations should contact me as soon as possible. At the beginning of the semester students should contact Disability Services for Students Office at 330 Memorial Union, (401) 874-2098, <http://www.uri.edu/disability/dss/>.

Academic Integrity: You are responsible for making yourself aware of and understanding the policies and procedures in the University Manual that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. Further information can be found in the UNIVERSITY MANUAL sections on Plagiarism and Cheating at

<http://web.uri.edu/manual/chapter-8/chapter-8-2/>

If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You should consult with me if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test. Violations of the academic honesty policies can result in failing grades for the assignment and the course. Additional penalties can be imposed by the University.

MTH 111 WeBWorK Schedule - Summer 2017 (Session 1)

The following calendar gives a detailed homework timetable for the course. Please note that assigned problems and due dates are subject to change, but all necessary changes will be reported by your instructor.

Please read through the following information:

- All assignments will be made available at the beginning of the course. After the first week, there are four due dates on **Wednesday evenings at 11:59 p.m.** and a fifth (and final) due date on **Thursday 6/22 at 11:59 p.m.**
- The last column lists the total number of problems assigned during that particular week. Make sure to get them all done by the due date!
- Late submissions will not be accepted for any reason. Answers for each problem set will be made available after the corresponding due date.
- There are **533 problems** assigned in WeBWorK this semester. Consult your course syllabus to see how WeBWorK is evaluated as part of your MTH 111 grade.
- **Please direct all questions and concerns to mth111webwork@gmail.com.**

Week & Deadline	§§	Assignments	#
5/22 - 5/25 Due 5/31	1.2 1.3 1.4 1.5 1.6 1.7	Inequalities (16) Intercepts and Graphs (7) Lines (22) Functions (20) Domain and Range (10), Equations and Graphs (14), Increasing and Decreasing (5) Transformations (12), Symmetry (9)	115
5/29* - 6/2 Due 6/7	1.8 1.9 2.1 2.2 2.3 2.4	Function Operations (10), Function Composition (10) Inverse Functions (22) Quadratic Functions (19), Quadratic Inequalities (3) Complex Numbers (19) Roots of Polynomials (16) Equations of Polynomials (13), Polynomials with Comp. Roots (13)	125
6/5 - 6/8 Due 6/14	2.6 2.7 3.1 3.2 3.3	Polynomial Graphs (19), Polynomial Inequalities (5) Asymptotes of Rationals (15), Rational Functions (14), Rational Inequalities (3) Angles (25) Sine and Cosine (22) Sine and Cosine Graphs (16)	119
6/12 - 6/15 Due 6/21	3.4 3.5 3.6 3.7 4.1	Tan/Sec/Cot/Csc (21), Tan/Sec/Cot/Csc Graphs (6) Inverse Trig Functions (20) Right Triangle Trig (15) There is no WeBWorK assignment for §3.7. Exponential Functions (9), Exponential Graphs (18), Exp. Equations (13)	102
6/19 - 6/22 Due 6/22	4.2 4.3 4.4	Logarithms (13), Logarithm Graphs (8), Log. Equations (15) Logarithm Rules (23) Logarithmic Equations with Rules (13)	72

*Classes normally meeting on Memorial Day (Monday, May 29th) will meet on Friday, June 2nd.