**Math 111 Pre-Calculus Summer 2018**


**Instructor:** Nikolas Townsend

**Office Hours:** Tuesday, Thursday 4:00-6:00, or by appointment

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**Classroom:** Prov 447

**Course Description (3 credits):** 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. (Lec. 3) Pre: passing a placement test or C- or better in MTH 101. Not for credit for mathematics majors.

**Course Objectives:** The primary goal of MTH 111 is to prepare you 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.

**Learning Outcomes:** This course demands a very substantial amount of hard work for 3 credits. 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/](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 Descarte’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 PCA’s, justify solutions and the problem solving process. Verify, interpret and communicate solutions with respect to the original problem.

C.2, C.3, STEM7

Calculators: A calculator is not needed on exams, however you may use a basic function (+, -, ×, ÷) calculator only. **A cell phone may not be used as a calculator.**

Sakai: The Sakai learning system is used for grades, announcements and various resources. Please check URI email and Sakai frequently.

Grading:

1. Assessments
   a. 3 Closed book, closed notes - 100 points each
   b. 1 Cumulative final exam - 200 points
   c. WebWork Homework - 100 points
   d. In class assignments - 50 points

2. Final Grade = (total points)/650 * 100 = percentage

A (92% - 100%) A- (90% - 91%)
B+ (87% - 89%) B (82% - 86%) B- (80% - 81%)
C+ (77% - 79%) C (72% - 76%) C- (70% - 71%)
D+ (67% - 69%) D (60% - 66%) F (0% - 59%)

Attendance and Make-up Policy:
1. Attendance for classes is required and class participation is strongly encouraged. Please be prompt. You are responsible for all material covered in class and any changes made to homework or dates whether or not you are there. Please find someone in class to communicate with.

2. Attendance for tests and the final exam are required. Absence from a test or the final exam without prior arrangements with me will result in a failing grade for the course. In the case of an emergency, please contact me immediately via email. Failure to do so will result in failing this course.

3. Make-ups for in class assignments or tests are allowed only for excused absences (university sponsored events or documented medical situations).

4. All other policies will be followed according to the University Manual

**In Class Assignments:** In-class assignments will be assigned each week. These assignments are often extensions of the material presented in class. They are open book and open notes.

**WebWork Homework:**
Online homework will be 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 fewer letters. Late submissions will not be accepted for any reason. All questions about WeBWorK should be directed to mth111webwork@gmail.com

Here is the WebWork schedule: https://sakai.uri.edu/access/content/group/d5e3709c380-4ff9-b557-a41983ee9c3b/MTH-111-WeBWorK-Calendar-Summer-2018- Session-2_.pdf

**Other Policies:**
1. Please come to class prepared by reading over the text to be covered and by bringing your book, notebook and pencil. When class starts, be prepared!! Pencils only please.

2. You are here to learn, so please give class your full attention, ask questions if you do not understand and be respectful and courteous to your fellow students and professor.

3. Please no disruptive behaviors that distract from the learning process. As examples:
   a. Talking while the instructor is talking.
   b. Sleeping, eating, texting, talking on, making or receiving cell phone calls, connecting/listening to any MP3/Electronic devices, reading non-course material, cursing, leaving early.

4. You may not record (audio or video) any or all of this class without the express written consent of the instructor.

5. For tests:
   a. Please come prepared with more than one pencil, an eraser and a sharpener.
b. Desks must be clear, backpacks, books etc must be placed in the front 
c. Be neat and organized. If I can’t follow your work, I can’t give you credit. 
d. Use the restroom before the test – no breaks during the test.

6. There is no extra credit in this course.
7. All URI University policies apply including the Academic Honesty policy found in your student handbook found at http://web.uri.edu/manual/. Cheating will be grounds for failing this course.
8. Students requiring accommodations due to a documented disability (through the Disability Services for Students: Office of Student Life) should make their requests as soon as possible.
9. Extra help is available from me, from the Academic Enhancement Center, or from Math department tutors. Helpful online resources include pulemath.com and khanacademy.org.