Departmental Syllabus for MAT 194 Pre-calculus
Fall 2018 MWF class; Tues./Thurs. recitation

Course Description: This course is designed to prepare you for success in the study of calculus. Using graphical, numerical, and symbolic representations, you will investigate the basic properties of many elementary functions, including linear, quadratic, polynomial, exponential, logarithmic, trigonometric, and rational. These functions and their applications will be the core focus of the course. You will engage in applied problem solving in collaborative group settings using graphing technologies. A second but equally important aim of this course is for you to refresh and retain the algebra skills necessary to succeed in your next math course. There will be weekly assignments and quizzes that will address these competencies.

Course Supervisor: Dr. Nicole Fonger, 103B Carnegie Building, nfonger@syr.edu. Please inform your instructor and/or recitation leader of any problems you have with this course. Problems not satisfactorily resolved with your instructor should be brought to the attention of the Course Supervisor.

Required Materials:

(1) Textbook: Connally, E., Hughes-Hallett, D., Gleason, A. M., et al. (2015). *Functions modeling change: A preparation for calculus* (5th ed.). Hoboken, NJ: John Wiley & Sons, Inc. Also available as a custom edition at the SU bookstore.

(2) WileyPlus access code. This will be included with a new copy of the textbook purchased at the SU Bookstore. Other options are available for purchase separately. Note: the WileyPlus access code includes an e-Book version of the textbook. You need not have both a hard copy of the text and an electronic version. However, the WileyPlus code is required.

(3) TI-84 or TI-83+ graphing calculator will suffice. A TI-84 Plus CE model is recommended. This may be purchased at a variety of local stores, including the Syracuse University Bookstore; you may also be able to borrow a calculator from the library for short periods of time. The calculator may be used on all homework, tests and the final exam. You should bring your calculator with you to class and to recitation. The use of a symbolic calculator (such as the TI-89 or the TI-Nspire with CAS) will not be allowed on quizzes or exams.

Prerequisites for Course: Students should be competent in the use of high school level algebra. Students should have successfully completed a unit on trigonometry at the high school or college level. A student cannot receive credit for MAT 194 after receiving a grade of C or better in any calculus course. Students that have low scores on the Calculus Readiness Exam are discouraged from taking MAT194. **Students MUST earn a grade of C- or better in MAT 194 in order to meet the prerequisites for taking MAT 295 Calculus I.**

Student Experience

How you take this course – the depth of engagement, and nature of effort – is largely your choice. Make this choice consciously in light of your academic goals.

Syracuse University, College of Arts and Sciences, Mission
"Preparedness: The College of Arts and Sciences at Syracuse University provides its students with a foundation of skills and knowledge that can be applied to many academic pursuits and career paths. Employers and graduate schools value one's ability to solve problems, adapt to change, collaborate with others, and work across disciplines—all basic tenets of a liberal arts that prepare students not only for job placement, but for success and for life."
For the complete Mission of the College see http://thecollege.syr.edu/overview.html

Class Preparation: You are expected to read the appropriate section of the text *prior* to the class in which that material is discussed. After the class presentation, you should re-read the material and work through all of the assigned problems.

The *only* way to learn mathematics is to *do* mathematics.

- You should work out and carefully write up all of the assigned exercises. A small portion of each lecture and most of recitation will be devoted to discussing these problems and others. You must fully complete each problem, plus any additional problems that you need to further your own understanding of the material. Most chapters in your textbook have a "*Skills Refresher*" section that provides help with basic algebra skills.

- You will be assigned to a homework group in your recitation. You should work with the members of your homework group to assure that you can do and understand all of the assigned problems. Most students find it beneficial to study for the tests with the members of their homework group.

- Ask questions. If something is not completely clear, ask about it in lecture, in recitation or at the clinic as soon as possible. Don't hesitate to bring questions to your course instructor or recitation instructor during office hours.

- Stay caught up. Math concepts build on each other cumulatively and you need to stay on top of the material at every stage. If you are having difficulty, don't expect that the problem will take care of itself and disappear later. Contact your course instructor or your recitation instructor immediately and discuss the problem.

Assessment

Homework: Homework assignments will be submitted in two ways:
- WileyPlus Online: All homework listed in the syllabus is formally assigned in WileyPlus and must be submitted online to receive credit.
- Team Homework: Some homework problems will be assigned separately as Group Homework. A complete, clean copy of each assignment is due at the beginning of each recitation session.

Quizzes: There will be regular quizzes both in and out of class time.
- WileyPlus: Weekly quizzes will be assigned and submitted on WileyPlus. Complete these individually and outside of class and recitation time. These will focus on developing fluency and mastery of algebraic skill and symbolic manipulation.
- Recitation: A quiz will be given each recitation session. These quizzes will be related to the textbook homework and problem solving from the relevant content being covered in class. There will be **NO MAKE-UP QUIZZES**.*

Examinations: There will be three examinations given this semester. See the Schedule for Exam dates. There will be **NO MAKE-UP EXAMS.***
> *Note*: For the engineering section, these exams will occur during class time. For non-engineering sections, these exams will be given during recitation.

*<u>**No make up quizzes or exams will be allowed, even in the case of an emergency.**</u> A missed quiz or examination counts as a zero unless the student presents a valid excuse from a physician or his or her dean's office. With the written excuse, your score on the relevant portion of the final exam will be used to replace the missed quiz or exam grade.

Final Examination: Your final examination will take place during a two-hour block on Wednesday, December 13. The time and location will be posted on your MySlice account later in the semester. You are required to take the final examination during the appointed examination block. **DO NOT MAKE PLANS TO LEAVE CAMPUS BEFORE 2:30 P.M. on December 13.**

Class Attendance and Participation: You are expected to attend and participate in class. This course is taught using lecture, small groups and class discussion. Your success will be limited without full attendance and participation.

Grading: Your final grade in this course will be based on your performance on homework, attendance and participation, quizzes, exams, and the final exam (which is cumulative). The relative weight assigned to each is designated below:

Homework (WileyPlus and Team Homework)	10%
Attendance and Participation (Lecture and Recitation)	5%
Quizzes	
Course Content (Recitation)	5%
Algebraic Skill and Fluency (WileyPlus)	10%
Exams (3 at 15% each)	45%
Final Exam	25%

Your final course grade will be assigned based on the following percentages:

93 - 100	A
90 - 92	A-
87 - 89	B+
83 - 86	B
80 - 82	B-
77 - 79	C+
73 - 76	C
70 - 72	C-
60 - 69	D
0 - 59	F

Resources

Math Clinic: Your instructor and recitation leader will be available regularly during each of her respective office hours. You can also seek assistance at the Math Clinic in Carnegie Room 102. The Clinic hours are posted: (a) outside the clinic (Carnegie 102), (b) outside the Math Department Office (215 Carnegie), and (c) on the department webpage (`http://math.syr.edu`).

CLASS Tutoring: Participate in CLASS Tutoring for FREE Group Tutoring Sessions. Learn together, get individualized support, and earn extra credit. Actively Participate in 5 sessions, earn 1 percentage point toward your overall grade. Attend 10 sessions, earn 2%. Attend 20 sessions, earn 3% (max).

> *Note:* See your Course Blackboard Site for additional resources intended to support your success in this course.

Academic Integrity: The Syracuse University Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the Policy and know that it is their responsibility to learn about instructor and general academic expectations with regard to proper citation of sources in written work. The policy also governs the integrity of work submitted in exams and assignments as well as the veracity of signatures on attendance sheets and other verifications of participation in class activities. Serious sanctions can result from academic dishonesty of any sort. For more information and the complete policy, see http://academicintegrity.syr.edu.

Students with Disabilities: If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), http://disabilityservices.syr.edu, located in Room 303 of 804 University Avenue, or call 315-443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible coordinating disability-related accommodations and will issue students with documented disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible. You are also welcome to contact me privately to discuss your academic needs although I cannot arrange for disability-related accommodations.

Religious observances policy. SU religious observances policy recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to are religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice (Student Services -> Enrollment -> My Religious Observances) from the first day of class until the end of the second week of class.

Suggested Pacing and Assignments

The following schedule includes the class Day, Date, Textbook Section, Homework Exercises, and Key Points. Exam dates are also listed. Modifications may be announced by your instructor and/or recitation leader.

Chapter 1. Linear Functions and Change

Day 1: Mon. 8/27   CRE/1.1   7, 9-15, 20-25, 36, 39,42,43,46

1.1.Functions and function notation
- The definition of a function
- Numerical, graphical and symbolic examples
- The vertical line test
- Basic function concepts and language

Day 2: Wed. 8/39   1.2   S9,S10, 8,10-16,19,20,29,31

1.2.Rate of Change
- The average rate of change of a function over an interval
- Increasing and decreasing functions
- Rate of change in function notation

Day 3: Fri. 8/31   1.3   4-9,13-18,20,29

1.3 Linear Functions
- Functions with a constant rate of change
- Construction of linear models
- Slope and the general form of a linear function

Recitation Week 1
- Problem solving task: "Tech-tivity": Cartesian Graphs and Modeling Dynamic Behavior
- In-class quiz
- Assign Group homework
- Reminder: Algebra Quiz 1 Due End of Week

Day 4: Wed. 9/5   1.4   S3,S5,S91,3,4,5,7,8,10,11,16,19,20,31,33,35,42,43,46,52,54

1.4 Formulas for Linear Functions
- Finding the formula representing a linear function from numerical data, the graph of a function or a verbal description.
- Parallel and perpendicular lines
- Horizontal and vertical lines

Day 5: Fri. 9/7   1.5   2,3,8-11,22

1.5 Modeling with Linear Functions
- Interpreting the effects of different rates of change and the initial values on the graphs of linear functions
- Interpreting parameters of a linear graph
- The intersection of two lines

• Linear inequalities in two variables

Recitation Week 2
• Problem solving: Tortoise and Hare Problem; the Candle Problem
• In class quiz
• Reminders: Algebra Quiz 2 Due End of Week; WileyPlus HW deadline this week

Chapter 2. Functions
Day 6: Mon. 9/10   2.1   S3,S4,S9,S10,1-4,23-28,32,35
2.1 Input and Output
• Basic function interpretation and manipulation using standard function notation
• The effect on a function of changing the input variable versus changing the output variable

Day 7: Wed. 9/12   2.2   S1-S4,1,2,5,6,8,9,10,13,15,31,36,37
2.2 Domain and Range
• Domain and range of a function
• Using a graph to find the domain and range
• Finding domain and range algebraically

Day 8: Fri. 9/14   2.3   2-5,8-11,13,21,22,26
2.3. Piecewise Defined Functions
• Piecewise functions
• Absolute value functions

Recitation Week 3
• Collect Group Homework #1
• Problem solving task
• In-class quiz
• Assign Group Homework #2
• Reminder: Algebra Quiz 3 Due End of Week

Day 9: Mon. 9/17*   2.6   1,2,9,13,15,18,20,25
*Financial/Academic Drop Deadline
2.6. Concavity
• The relationship between the behavior of the rate of change of a function and the concavity of the function's graph

Chapter 3. Quadratic Functions
Day 10: Wed. 9/19   3.1   S4,S5,S9,S10,1,3,6,9,10,12,13,15,26,27,35,37,41
3.1. Introduction to the Family of Quadratic Functions
• The general formula for quadratic functions
• Finding the zeros of a quadratic function
• Concavity of quadratic functions

Major Assessment

Day 11: Fri. 9/21   Exam 1

Day 12: Mon. 9/24	3.2	1-4,6,7,9,10,11,27,28,29,31,33,34,45

3.2. The Vertex of a Parabola
• The vertex form for a quadratic function
• Completing the square
• Modeling with quadratic functions

Chapter 4. *Exponential Functions*

Day 13: Wed. 9/26	4.1	S1-S4,1,2,3,8,18,20,21,24,29,32-34,40,51,52,56

4.1. Introduction to the Family of Exponential Functions
• Growth factors and growth rates
• Decay factors and decay rates
• The definition of an exponential function

Day 14: Fri. 9/28	4.2	S3,S4,1,2,4,6,8,10,15,20,28-30,35,37,48,49

4.2 Comparing Exponential and Linear Functions
• How to determine when a function is linear
• How to determine when a function is exponential
• Finding formulas for exponential functions

Day 15: Mon. 10/1	4.3	1,3,5,11-14,18,25-30,36,40,42,43

4.3. Graphs of Exponential Functions
• The possible appearances of the graphs of exponential functions
• The effect of the initial value on the appearance of the graph of an exponential function
• The effect of the growth factor on the appearance of the graph of an exponential function
• Why exponential functions have horizontal asymptotes
• Understanding limit notation and limits to infinity

Day 16: Wed. 10/2	4.5	3-5,8-11,20-22

4.5. The number e
• Basic facts about the number e
• Continuous growth rates

Chapter 5. *Logarithmic Functions*

Day 17: Fri. 10/5	5.1.	1,3,5,7,8,11-16,22-27,35,36,51,53,54,57,63,67,68

5.1. Logarithms and their properties
• Using logarithms to solve exponential equations
• The definition of the logarithm function
• The equivalence of exponential and logarithmic expressions
• The inverse relationship between the $y = \log(x)$ and $y = 10^x$

Recitation Week 6
• Problem Solving
• In-class quiz
• Reminder: Algebra Quiz 5 Due end of week; WileyHW deadline this week

Day 18: Mon. 10/8	5.2	2,5,9,11,15,16,23,27,39,42,43,45,55

5.2. Logarithms and exponential models
• Using logarithms to determine doubling time and half-life for exponential growth and decay models
• Conversion between different bases in exponential functions

Day 19: Wed. 10/10	5.3	S7,S9,1,3,5,7,9,10,32,54

5.3 The Logarithmic Function and Its Applications
• Domain and range of the common logarithm function
• The graph of the common logarithm function
• Applications of logarithms to sound and pH levels
• Asymptotes of the common logarithm function
• Using limit notation to understand asymptotes

Chapter 2. Transformations of Functions and Their Graphs

Day 20: Fri. 10/12	2.4	1,3-6,7,8,10,18

2.4. Horizontal and Vertical Shifts
• Horizontal and vertical graphical shifts
• Finding a formula for a shifted graph in terms of the formula for the original graph

Recitation Week 7
• Problem Solving Activity
• In class quiz
• Collect Group Homework #3
• Assign Group Homework #4
• Reminder: Algebra Quiz 6 Due end of week

Day 21: Mon. 10/15,	6.1	S8,S10,1,9,10,14,16,18-21,26,27,32-34
	6.2	S4,1,2,8,11,12,15,22,28,29,39

6.1. Shifts, Reflections and Symmetry
• Reflections across the x or y-axis
• Symmetry
• Algebraic and geometric descriptions of even and odd functions

6.2. Vertical Stretches and Compressions
• The effect of multiplying a function by a constant

Day 22: Wed. 10/17	6.3	S4,S11,S16,1,8,11-17,19,25,32-37,49,50

6.3. Horizontal Stretches and Combinations of Transformations
• Understanding the effect of multiplying the input variable of a function by a constant
• Understanding the effects of multiple transformations applied in succession

Major Assessment

Day 23: Fri. 10/19	Exam 2

Recitation Week 8
• Review for Exam 2
• Answer HW Questions
• Reminders: No Algebra Quiz this week; WileyPlus HW deadline

Chapter 7. Trigonometry and Periodic Functions

Day 24: Mon. 10/22	7.3	1,2,3,5,6,7,10,12,21,22,25,27,29,31,32,35-38,55

7.3. Radians and Arc Length
• Angles on the unit circle (What is an angle?)
• Positive and negative angles
• Radian measure of angles (What is a radian?)
• Converting between degrees and radians
• Arc length

Day 25: Wed. 10/24	7.1	1,10,12,23,25,27,29
	7.2	1,10,11,12,14,19,23,25,34

7.1. Introduction to periodic functions
• Graphing a periodic function
• Amplitude, midline and period

7.2. The Sine and Cosine Functions
• The definitions of the cosine, sine and tangent functions in terms of the unit circle
• Reference angles

Day 26: Fri. 10/26.	7.4	1,2,5,7,17,19,21,27,28,38

7.4. Graphs of the Sine and Cosine
• Graphing $y=A\sin(t)$ and $y=A\cos(t)$
• Graphing $y=\sin(t)+k$ and $y=\cos(t)+k$
• Amplitude, period, and midline

Recitation Week 9
• Problem Solving
• In class quiz
• Collect Group Homework #4
• Assign Group Homework #5
• Reminder: Algebra Quiz 7 Due end of week

Day 27: Mon. 10/29	7.5	1,2,5,7,13,15,18

7.5. Sinusoidal Functions
• Graphing $y=A\sin(B(t-h))+k$ and $y=A\cos(B(t-h))+k$

• Amplitude, period, frequency and horizontal shift • Finding formulas for periodic functions using sine and cosine		

Day 28: Wed. 10/31	7.6.	2-10, 11-14, 21, 24, 25, 27, 35
	7.7.	4-6, 9, 12, 15, 17, 18, 20, 21

7.6. The Tangent Function
• The definitions of the tangent function
• Trigonometric identities

7.7. Trigonometric Relationships and Identities
• Understanding the relationships between the sine, cosine, and tangent functions

Day 29: Fri. 11/2	8.1	3,4,6,7,9,11,13,14,19,27,28

8.1 Trig Functions and Right Triangles
• The sine and cosine functions in right triangles
• The tangent Function in Right Triangles
• The inverse trigonometric functions for triangles

Recitation Week 10 • Problem Solving: Modeling with Trig Functions • In class Quiz • Reminder: Wiley Plus HW Deadline, Algebra Quiz 8 Due this week		

Compositions, Inverses, and Combinations of Functions

Day 30: Mon. 11/5	2.5	S2,S4,S11,5-12,34-37,39

2.5. Composite and Inverse Functions
• The concept of composite functions
• The concept of inverse functions
• Finding the composition of function algebraically
• Finding the formula for an inverse function

7.8. Inverse Trigonometric Functions
• Introduction to the inverse trigonometric functions

Day 31: Wed. 11/7	9.1	2, 3, 7, 12, 15, 18, 21, 39, 40, 41

9.1. Trigonometric Equations
• Solving trigonometric equations graphically and algebraically
• Multiple solutions

Day 32: Fri. 11/9	9.2	1, 4, 10, 14, 20, 31, 35, 39, 40, 50, 54

9.2. Identities, expressions, and equations
• The difference between an equation and an identity
• The Pythagorean and double angle identities

Recitation Week 11
• Problem Solving Activity
• In class Quiz
• Collect Group HW #5
• Assign Group HW #6
• Algebra Quiz 9 this week

Day 33: Mon. 11/12	10.1	1, 2, 6, 17-21, 25, 26, 30, 31, 59, 70, 71

10.1 Composition of Functions
• Finding the composition of two functions numerically, graphically and symbolically
• Interpreting the composition of two functions
• Decomposing a function

Day 34: Wed. 11/14

Review / cover content from above (Sections 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 8.1, 2.5, 7.8, 9.1, 9.2)

Major Assessment

Day 35: Fri. 11/16	Exam 3

Recitation Week 12 • Review for Exam 3 • Reminder: WileyHW Due, No Algebra Quiz this week		
Thanksgiving Break Sunday Nov. 18 – Sunday Nov. 25 – No Classes (Univ. offices Open Mon-Wed.)		
Chapter 11. *Polynomial and Rational Functions* Day 36: Mon. 11/26	11.2	1,3,4,8,10,18,19,21,22,23,25,44
11.2 Polynomial Functions • Standard terminology associated with polynomials • The long-run behavior of polynomials • Zeros of polynomials		
Day 37: Wed. 11/28	11.3	S1-S5,1,2,5,9,11,15,18-21,27,30,33,35,44
11.3 The Short-Run Behavior of Polynomials • Factored form of a polynomial • Multiple zeros • Reconstructing the formula for a polynomial from its graph		
Day 38: Fri. 11/30	11.4	S2,S3,S9,1,4,8,13-15,17-21,27,35
11.4 Rational Functions • Graphs and formulas of rational functions • Horizontal asymptotes: long-run behavior		
Recitation Week 13 • Problem Solving • In class quiz • Collect Group Homework #6 • Reminder: Algebra Quiz 10 Due this week		
Day 39: Mon. 12/3	11.5	1,3,5,6,8,9,14,15,20,21,32
11.5 The Short Run Behavior of Rational Functions • Zeros of rational functions • Locating vertical asymptotes of rational functions • Local behavior of rational functions • Using limits from the left and from the right to investigate local behavior • Factored form • Holes in graphs of rational functions		
Day 40: Wed. 12/5 Review / flex day		
Day 41: Fri. 12/7	Comprehensive Review	
Recitation Week 14 • Review for Final Exam • Reminder: Wiley Plus HW due this week		
Finals Week		
Tues. 12/11	Reading Day	
Major Assessment		

| Wed. 12/12 | **Final Comprehensive Exam (2 HR block from 8:00AM - 2:30PM – specific time TBA)** |