



## Calculus with Analytic Geometry I (MTH 173)

2016-2017

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### Course Description (RCC MTH 173):

This two-semester calculus course covers begins with an intuitive discussion of limits both graphically and numerically. Students will develop a conceptual understanding of the derivative before proceeding to formal rules for differentiation. In the second semester, students will estimate the area under a curve using Riemann sums and then learn techniques of antidifferentiation to determine exact area under a curve. As in a traditional calculus course, derivatives and integrals of transcendental functions will be discussed independently. At all times, applications of derivatives and integrals will be emphasized, whenever possible linking to the marine science curriculum.

### Text:

Calculus of a Single Variable, 10th Ed.; Larson and Edwards: Cengage Learning; 2017

*Please cover this text and keep it covered throughout the year!*

**Course Credit:** 5 dual enrollment credits/1 high school credit

### Contact Information:

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**Classrooms:** For at least the first semester, Monday – Thursday I will be teaching in Room 118 (found in Workforce Development). On Friday I will be teaching in Room 172.

**Office:** My office is Room 151D. I am available at CBGS from 7:30 AM to 3:00 PM by phone or email and at the home or cell number after school.

**Required Materials:** Two 3-ring binders, one for each semester, pencils, a large block eraser, and a graphing calculator. (I will be using one of the TI-83 graphing calculators in class. Students are welcome to use a different model, but I will be able to provide only limited assistance.) A limited number of TI calculators are available from the instructor to be checked out if needed—feel free to ask. Graph paper and colored pencils may be useful.

**Attendance:** Student success has been shown to be linked to attendance; please attend all classes whenever possible. However, I understand that both emergencies illnesses occur. Therefore, at student requests I will be posting all lecture notes and worksheets to Schoology under this course and the materials tab for the given chapter. It will be the student's responsibility to access, print, and review the materials. If further assistance is needed, please feel free to ask.

## Course Objectives for Calculus with Analytic Geometry I (Math 173)

Students will demonstrate the ability to:

1. Understand the concept of a limit.
2. Find limits of polynomial, rational, trigonometric and transcendental functions.
3. Define continuous functions, recognize points of discontinuity of functions, and describe the behavior of functions in the neighborhood of their discontinuities.
4. Define the derivative of a function and apply that definition to appropriate functions analytically, graphically, and numerically.
5. Know and apply the various rules and techniques of differentiation such as the power, product, quotient and chain rules.
6. Find derivatives using implicit differentiation.
7. Apply the derivative in appropriate settings, in particular to problems involving position, velocity and acceleration (kinematics), related rates and optimization.
8. Use Newton's Method to find roots of functions.
9. Sketch graphs of various functions using the derivative.
10. Reverse the operation of differentiation using the antiderivative.
11. Find the antiderivatives and indefinite integral of algebraic, exponential, and trigonometric functions.
12. Use Riemann Sums and definite integral to find areas;
13. Know and apply the Fundamental Theorem of Calculus.
14. Find antiderivatives using a variety of techniques including substitution, tables, integration by parts and partial fractions.
15. Approximate definite integrals using numerical techniques, such as the trapezoid rule, Simpson's method, and calculator/computer programs.
16. Solve differential equations, graph slope fields, and apply Euler's method.
17. Apply integration techniques to solve problems involving areas, volumes, arc length, and differential equations.

### **Learning Sequence:**

#### P: Preparation for Calculus

- Rates of change
- Piecewise defined functions
- Domain, range, interval notation

#### 1: Limits and their Properties

- Limits graphically and numerically
- Evaluating limits analytically
- Continuity and one-sided limits
- Infinite limits

#### 2: Differentiation

- Secants, the tangent line problem, and the derivative
- Basic rules of differentiation and rates of change
- The product and quotient rules for differentiation
- Higher order derivatives
- The chain rule
- Implicit differentiation
- Related rates

### 3: Applications of Differentiation

- Extrema on open and closed intervals
- Rolle's Theorem and the Mean Value Theorem for derivatives
- Increasing and decreasing functions
- The first derivative test
- Concavity
- The second derivative test
- Limits at infinity
- Curve sketching
- Optimization problems
- Newton's method

### 4: Integration

- Estimating area under a curve
- Riemann sums
- Definite integrals
- Antiderivatives and indefinite integrals
- The Fundamental Theorem of Calculus (I)
- The Fundamental Theorem of Calculus (II)
- Integration by substitution
- Numerical integration

### 5: Logarithmic, Exponential, and Other Transcendental Functions

- Natural logarithmic function
  - Differentiation
  - Integration
- Inverse functions
- Exponential functions
  - Differentiation
  - Integration
- Bases other than  $e$  and their applications
- Inverse trigonometric functions
  - Differentiation
  - Integration

### 6: Differential Equations

- Verifying solutions to differential equations
- Finding general and particular solutions to basic differential equations
- Solving separable differential equations
- Slope fields and Euler's method
- Differential equations
- Growth and decay problems

## 7: Application of Integration

- Determining the area between two curves
- Volume
  - Disk method
  - Shell method
- Arc length
- Area of a surface of revolution
- Work

**Make-up work policy:** Except for extreme circumstances, I will avoid having students complete makeup tests and quizzes during class time. The student will need to make prior arrangements with the instructor to take the assessment before CBGS, after CBGS, or at their home school. In an emergency, a home school faculty member can be requested to serve as proctor.

Quizzes and tests are expected to be made up in a timely manner. Any long term projects assigned will have information regarding late submission. For homework guidelines, please see the information below.

**Honor Code:** Students are expected to follow the rules and procedures as outlined in the Student Honor Code. Please refer to the Student Handbook if you need guidelines. Failure to do so may result in dismissal from the course. Tests, quizzes, and other work as requested will be pledged.

### ***Course Expectations and Information:***

1. **Technology in the classroom:** You may not use laptops in my class for any purpose other than directed assignments. It is disrespectful to the instructor to not give him your full and undivided attention. Again: please, no laptops. Additionally, all cell phones (and other electronic devices) must be silenced and out of sight (mine and yours) during class. If used in an unauthorized manner, electronics may be confiscated and returned at the end of the class period. Repeat offenders will be referred to the CBGS director. Please see the cell phone policy in the Student Handbook.
2. **Student responsibilities:** I will be posting assignments to MathXL and updates and materials to Schoology on a regular basis. It is your *obligation* to be aware of and adhere to all posted deadlines. Not knowing the deadlines for posted assignments will not excuse the assignment. See more on homework below.
3. **Homework:** Homework will be assigned daily to correspond to the classroom lecture. Assignments will be MathXL assignments and you will have at least a week to complete each assignment. On the class period following when the assignment was given, there will be an opportunity to ask questions about anything you are having difficulty with. Note even though I give you a week, waiting that long to complete an assignment means you will not be able to ask questions when you have the opportunity on that following class period. Because there is no limit to the number of times you can work a specific type of problem to get it correct, every student has the ability to earn 100% on their homework grades. Every problem completed will be worth  $\frac{1}{2}$  of a point on your homework grade which will be reported on Schoology twice a quarter. For example, if 48 problems were assigned during the first half of the nine weeks, it will show up as a 24 point homework interim grade. If you miss the deadline for an assignment, it will close. Upon student request, the assignment may be re-opened, but chronic abuse is not acceptable and may result on a loss of homework points due to late submission.

4. **Be Prepared:** Regardless of whether homework is graded or not, it will be essential to student *survival*. Promise. No siestas, no holidays. If you fall behind, you will have to work at least twice as hard to catch up. Always do homework, always take notes, always ask questions, always be prepared.
5. **Class Participation:** You **MUST** ask questions about concepts that you feel need better clarification. Do not worry about anyone's reaction, ask. Be engaged from the beginning and stay that way. Remember, I do not start actually teaching until you start asking questions. Until that point, I might as well be working from a script.
6. **Notebook:** As mentioned earlier, you will want a 3-ring binder. All materials I give you (quizzes, tests, worksheets, handouts, ...) will be three-hole punched and need to be kept in your binders. **BE ORGANIZED.** Very few sloppy students can be successful math students. Many of you find that if you are physically disorganized, you will also be mentally disorganized...not good for mathematics. Your notebook will also be an available resource for your end of course exam.
7. **Grading:** I use a "total points" system. Every assignment (quiz, test, classwork, homework) will be given a number of points it is worth (the sum of the points from all of the questions). Your grade will be the points you earned relative to the points the assignment was worth. To compute your average at any point in the semester, take the total points earned and divide by the total points available.
8. **Exams:** You will have an exam in May that will be cumulative for the year of Calculus. The exam will weigh 10% of your year grade. The exam will be open notebook. Every test, quiz, handout, worksheet, and homework assignment is permissible for use on the exam. However, no materials photocopied from the text or another student's notebook, nor any outside printed resource material, may be used on the exam,
9. **Tips on how to survive this and other college level courses:**
  - Do not fall behind.
  - Do all homework.
  - Ask questions.
  - Form a study group or just do homework with a partner.
  - Be organized!!
  - Schedule your time and use it effectively!
  - You need to be self-motivated in college!