# Patrick & Henry Community College

MTH 263-G1 - **Calculus I**
2024-2025
Jenny J. Whittaker

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**OFFICE LOCATION:** PHCC West Hall, room 202

**OFFICE HOURS:** M-F 11:00 AM – 2:30 PM, or by appointment

**OFFICE PHONE:** 276-656-0328 ext. 3

**E-MAIL ADDRESS:** jwhittaker@pgsmst.com

**CLASS MEETING TIME:** M/W 9:25 AM – 10:55 AM

**CLASSROOM LOCATION:** PHCC West Hall, room 224

**MODE OF DELIVERY:** face to face

**COURSE CREDITS:** 4

**PREREQUISITE(S):** a placement recommendation for MTH 263 and four units of high school mathematics including Algebra I, Algebra II, Geometry and Trigonometry or equivalent OR completion of MTH 167 or MTH 161/162 with a grade of C or better.

**COURSE DESCRIPTION**
This course presents concepts of limits, derivatives, differentiation of various types of functions and use of differentiation rules, application of differentiation, antiderivatives, integrals and applications of integration.

**COURSE INTRODUCTION**
Calculus was developed in the 17th century independently and simultaneously by Sir Isaac Newton and G. W. Leibniz. They argued over the ownership of calculus for 25 years. It has now been established that Newton developed calculus first, but Leibniz was the first to publish on the subject. The application of calculus occurs in many disciplines: to compute the gravitational force of an object near the surface of the earth in physics; to compute reaction rates in chemistry; to model population growth in biology and sociology; and to model compound interest in economics. The general purpose of this course is to prepare students for further study in calculus with analytic geometry by providing them with the necessary competencies in finding limits, differentiation, and integration.

**A. COURSE OBJECTIVES**
Upon successful completion of this course, the student should:

- Develop effective study skills to master course content and objectives.
- Demonstrate an understanding of the basic mathematical skills used in calculus.
- Communicate clearly and effectively the principles of calculus using proper vocabulary.
- Apply the principles and concepts of calculus to solve practical problems in mathematics.
- Work with functions represented in a variety of ways and understand the connections among these representations.
- Understand the meaning of the derivative in terms of a rate of change and local linear approximation and be able to use derivatives to solve a variety of problems.

- Understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of change and be able to use integrals to solve a variety of problems.
- Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
- Model a written description of a physical situation with a function, a differential equation, or an integral.
- Use technology to help solve problems, experiment, interpret results, and verify conclusions.
- Determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.
- Develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.

**1st Semester**

**Prerequisites to Calculus**

- Graphs and models
- Linear models and rates of change
- Functions, graphs, and domain restrictions
- Exponential and logarithmic functions
- Review of trigonometric functions and equations

**Unit 1 – Limits and Their Properties**

- Finding limits graphically and numerically
- Evaluating limits analytically
- Continuity and one-sided limits
- Infinite limits and limits involving infinity
- Asymptotic and unbounded behavior
- Understanding asymptotes in terms of graphical behavior
- Describing asymptotic behavior in terms of limits involving infinity
- Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem)

**Unit 2 – Differentiation**

- The concept of the derivative presented geometrically, numerically, and analytically
- Definition of derivative: limit of the difference quotient
- The tangent line problem
- Slope of a curve at a point
- Basic differentiation rules, velocity, and other rates of change
- Product Rule, Quotient Rule, and higher order derivatives
- Derivatives of trigonometric functions
- Derivatives of logarithmic and exponential functions
- Chain Rule
- Differentiating functions involving radicals
- Implicit differentiation
- Logarithmic differentiation
- Derivatives of inverse functions
- Find the equation of tangent and normal lines
- Recognizing the difference quotient as the derivative
- L'Hopital's Rule

**Unit 3 – Applications of Differentiation**

- Extrema on an interval
- Rolle's Theorem and The Mean Value Theorem

- Increasing and decreasing functions and the First Derivative Test
- Concavity and the Second Derivative Test
- Corresponding characteristics of graphs of $f$ and $f'$
- Relationship between the increasing and decreasing behavior of $f$ and the sign of $f'$
- Corresponding characteristics of the graphs of $f$,$f'$, and $f''$
- Relationship between the concavity of $f$ and the sign of $f''$
- Finding points of inflection
- Graphing summary including zeros, domain and range, asymptotes, symmetry, extrema, and concavity
- Optimization problems
- Modeling rates of change, including related-rates problems

**2nd Semester**

**Unit 4 – Implicit Differentiation and Applications**

- Implicit Differentiation with respect to time
- Inverse trig derivatives
- Related Rates

**Unit 5 – Integration**

- Understand the concept of area under a curve using a Riemann sum and Trapezoidal Rule
- Use the limit of a Riemann sum to calculate a definite integral
- Computing definite integrals numerically using a graphing calculator
- Definite integrals and Anti-derivatives
- Fundamental Theorem of Calculus
- The Second Fundamental Theorem of Calculus
- Techniques of integration including ***u***-substitution
- Integration of trigonometric functions
- Integration of the natural logarithmic function
- Integration of the exponential function
- Differentiation and integration of bases other than $e$
- Differentiation and integration of inverse trigonometric functions

**Unit 6 – Applications of Integration**

- Use definite integrals to find the area under a curve
- Average Value of a function
- Use definite integrals to find the area between two curves
- Using integration as a rate of change
- Using integration to determine net change
- Using integration to determine position, velocity, and acceleration of an object

**Unit 7 – Extension (If time permits)**

- Volumes of solids of revolution using disks and washers
- Volumes of solids of revolution using cylindrical shells
- Volumes of solids with known cross sections
- Solving differential equations using separation of variables
- Exponential growth and decay
- Slope fields

**B. VCCS CORE COMPETENCIES**

Degree graduates will demonstrate the ability to

**1.1** Understand and interpret complex materials;
**2.6** Use problem solving skills;
**4.1** Determine the nature and extent of the information needed;
**4.2** Access needed information effectively and efficiently;
**6.1** Use logical and mathematical reasoning within the context of various disciplines;
**6.2** Interpret and use mathematical formulas;
**6.3** Interpret mathematical models such as graphs, tables and schematics and draw inferences from them;
**6.4** Use graphical, symbolic, and numerical methods to analyze, organize, and interpret data;
**6.5** Estimate and consider answers to mathematical problems in order to determine reasonableness; and
**6.6** Represent mathematical information numerically, symbolically, and visually, using graphs and charts.

**C. METHOD OF INSTRUCTION**

A variety of instructional methods will be utilized. As a group we will work extensively on study habits, appropriate use of the graphing calculators, and student communication – both oral and written. Students will be encouraged to actively participate in the learning process to help ensure that they understand the material. Many examples will be provided through lecture and class activities. The use of e-mail /Canvas/ ThinkWave is essential.

**D. TEXTBOOK(S) AND REQUIRED TOOLS OR SUPPLIES**

*Calculus of a Single Variable: Early Transcendental Functions,* 5th edition
Ron Larson & Bruce Edwards
Brooks/Cole, 2011
To be used in class only.

**Supplies**

- Pencils
- One 2-3" 3-ring binder
- Loose-leaf paper
- TI-84 Graphing calculator (may be checked out from the school)

## E. STUDENT EVALUATION

**Grades will be calculated using the points system (i.e. $\frac{points\ earned}{points\ possible}$ x 100). Each assignment will be worth a certain point value depending on the level of difficulty. Students will be assessed in various ways, including, but not limited to, homework assignments, activities, assessments, and projects.**

**9 weeks grading periods are calculated by the following. Each grading period grade is 40% of your final grade.**

- **Homework**
  - For each lesson, students will be provided a note sheet and practice problems to complete for homework.
  - Students will discuss homework daily with a study partner. This will be followed by a class discussion led by the instructor.

- Homework should be kept in a three-ring binder and should be organized chronologically by lesson number.

- **Quizzes – 50 points**
  - There will be 2-3 quizzes on the material you have learned for each unit. These quizzes are cumulative.
  - Quizzes will be completed in class and will be taken individually with the use of notes.

- **Tests – 100 points**
  - A test will be given at the end of each unit. Tests are a combination of multiple choice and free-response questions.
  - Tests will be completed in class and will be taken individually without the use of notes or other resources.
  - If your test grade is higher than your quiz average, your quiz grade will be adjusted to match your test score.

- **Projects – 50 or 100 points**
  - Students will be assigned projects throughout the semester to assess students' mastery of course content.
  - Depending on the level of difficulty, projects will be worth 50 points or 100 points as specified on the grading rubric provided with the project guidelines.
  - Projects not submitted by the due date will incur a 20% deduction per day after the due date.

**Final Exam** - An exam will be given at the end of the semester and will count 20% of the semester grade.

**There are a few policies regarding final exams found in the Governor's School student handbook:**

- All students are expected to take exams on the day they are scheduled for each class.
- Students are to be in attendance each day that exams are scheduled. If a student is absent on an exam day, they will only be allowed to make up the exam if the absence can be confirmed with a medical note from a physician or if there was a death in the student's family. We do ask if an emergency arises on an exam day and your child is not able to attend or will be late that you please call the Governor's School office at 276-656-0328 to let us know.

**F. GRADING SCALE:**

| | |
|---|---|
| **A** | 90 - 100 |
| **B** | 80 - 89 |
| **C** | 70 - 79 |
| **D** | 60 – 69 |
| **F** | 59 – below |

*A student earning a grade of C or higher will earn college credit for this course.*

**G. EXPECTATIONS FOR STUDENT SUCCESS**

- Be present for each class
  - Students should email the instructor when missing a class. All lessons will be recorded and uploaded into the Canvas Module for that date. Make sure to watch the videos and complete the accompanying assignments by the due date.
  - Students should submit a note to Mrs. East within 24 hours of the student's return with a valid reason for student's absence. ***No make-up work will be allowed*** for unexcused absences.
  - Students should see instructor the day returning from a missed class to ask questions pertaining to the lecture and/or assignment.
  - Students should make arrangements to make up quizzes/tests if missed due to absence.

- Submit all work on time.
  - Students should submit all work by the due date. Assignments not submitted by the due date will incur a 20% deduction per day after the due date.
  - Work that is to be submitted on Canvas should be uploaded in the Assignment Tab for the specified assignment. Work should be scanned and uploaded as one document. To submit assignments on Canvas, click on the link for the assignment, then upload the file, preview the file to ensure that all portions or problems are present, then click the "submit" icon. Log out, log back in, and make sure to double check that your submission went through. "Canvas must not be working" is not an excuse for late work.

- Check grades often
  - Although all lessons are available and all work is submitted through Canvas, grades will be entered in ThinkWave. Please make sure to check these every day. If there is a problem, see me immediately. DO NOT wait until the end of the 9 weeks to discuss a problem.
  - If you are caught cheating, that grade will be recorded as a zero.

- Create a fun learning environment.
  - Students may have drinks in the classroom, provided the drink has a screw-on cap. Students must leave their area clean.
  - Students should show respect for classmates and instructor, listen carefully, and not interrupt someone who is talking.
  - Cell phones and apple watches may not be used in class unless permission is given by the instructor. All other devices must remain closed unless needed for an assignment. Phones and apples watches must be placed in silent mode and placed in your personal designated area upon entering the classroom.

**WHAT A STUDENT CAN EXPECT FROM THE INSTRUCTOR**

- On any day that a student is absent from class, the student will be able to access the recorded lesson and proceed as if he/she were in class.
- Homework posted on Canvas upon a student's absence from class will be assessed, and feedback provided within 48 hours.
- The instructor will evaluate and return quizzes and tests work promptly with feedback.
- The instructor will be available before school by 7:15 A.M., between classes, and after governor's school for tutoring.
- Continuous support, assistance, and encouragement.
- Timely responses to emails. Students should email the instructor using their pgsmst email accounts and emails should be sent to jwhittaker@pgsmst.com. I check my email frequently each day to answer any questions about homework, assignment clarification and will answer quickly. If outside of school hours, responses may be delayed, but I do still try to respond quickly.

**H. EMERGENCY INFORMATION**

In case of emergency, students should exit according to the evacuation plan posted in the classroom.

**I. STUDENT SUPPORT/DISABILITY STATEMENT:** *If you have a disability or other need for reasonable accommodation in order to successfully complete the requirements of this course, please contact the 504/ADA Coordinator (Learning Resource Center #109D, 276-656-0257 or 800-232-7997 ext. 0257, disabilityresources@patrickhenry.edu) to discuss this matter confidentially.*

**J. IMPORTANT DATES TO REMEMBER:**

The school calendar is available on the back of the student planner and at the following link: www.pgsmst.com .

**K. SPECIFIC COLLEGE POLICIES**

**Academic Honesty**

Students are expected to abide by the code of conduct and academic integrity found in the student handbook. Students will be required to sign a pledge on any take-home quizzes/tests stating *"On my honor, I have neither given nor received aid on this assignment."* Infractions of the honor code will not be tolerated and will be reported to the director and will be addressed with the student and his/her parent(s). All violations of academic integrity will also be reported to each student's honor organization.

**Inclement Weather**

If Henry County schools are delayed one hour, Governor's School will open one hour late. If Henry County schools are delayed two hours, Governor's School classes will be cancelled. If Henry County schools are closed, Governor's School is closed and classes do not meet. Henry County/Martinsville work days do not impact classes at Piedmont Governor's School.

- Assignments and/or lectures may be posted on Canvas on days when Governor's School classes are affected by inclement weather. It is the student's responsibility to check Canvas and complete the assignments before their next class meeting.
- A link will be established on Canvas where students should submit homework that is due on a day where governor's school is cancelled. Homework should be posted by 7:30 AM of the day the assignment is due.

**Internet Resources**
https://www.**khanacademy**.org/
google.com

**Student Procedures for using the Learning Resource Center (LRC):**

The LRC Building will be open Monday – Thursday, 8am – 5pm with limited space due to required social distancing. Students will need to sign-in when entering the building and give the area they will use (computer lab, library, etc.). The computer lab and library will have a reduced number of computers available for **coursework only**. Tables in the Learning Lab will be limited to one person per table. Computers and tables will be assigned at sign-in and a number given which is to be returned when the student leaves. Before being issued again, the computer/table will be sanitized. Students will need to sign-out when leaving the building.

**Need Extra Help with Content**

- **Brainfuse**

Brainfuse is an online tutoring service which gives students 24/7 access to highly qualified, experienced, and specially trained tutors. Students may submit writing assignments to be evaluated/proofread. All live sessions with tutors and submitted questions are saved so students can view or print them out . Any PHCC student can access Brainfuse ***free*** of charge. Brainfuse can only be accessed through Canvas. Further information may be obtained from your instructor or the Writing Center Tutors.

- **PHCC Math Lab**
  The PHCC Math Lab is located in the LRC. Hours for this lab change each semester and are posted in the lab and on the PHCC website (academics>math resources). Experienced math tutors are always available in the math lab to assist students with their math. In addition, the math lab has computers available for student use. The PHCC tutoring coordinator can be reached at 276-656-5496 to schedule free, individual tutoring.
- Some other resources for tutoring are as follows:
  - Youtube
  - Khan Academy
  - Teacher Tube
  - Canvas – Teacher instructional videos

**M. AFFIDAVIT**

My signature below indicates that I have read and understand this syllabus.

Student Name (Print)_____ Parent/Guardian Name _____

Student Signature _____ Parent/Guardian Signature _____

Date _____ Date _____

Note: *This syllabus is subject to change at the discretion of the instructor. It is the responsibility of the student to keep abreast of these changes.*

**This syllabus conforms to the Patrick & Henry Community College syllabus guidelines.**