MATH 181 Calculus — 4 credits

March, 2026

Prerequisites: Precalculus, College Algebra and Trigonometry

Faculty: Matt Dodd, MS, Department Chair

Contact Information: Faculty may be contacted through the Canvas messaging system

Additional Information: www.portagelearning.edu[1*]

Course meeting times: MATH 181 is offered continuously

Course Description: This course introduces the concepts of limits and continuity and their role as the foundation of calculus. Using limits, students develop the definitions of the derivative and the definite integral. Differentiation techniques are introduced, and applications of derivatives include slopes of tangent lines, rates of change, optimization, and related rates. The course also covers indefinite and definite integrals, the Fundamental Theorem of Calculus, and applications of integration including area under a curve, work, arc length, and volumes of solids of revolution.

Course Outcomes: Upon successful completion of the coursework, students should be able to:

1. Review and apply foundational algebraic, functional, and trigonometric concepts necessary for understanding and performing calculus operations.
2. Define and evaluate limits of functions graphically and algebraically to understand the concept of continuity and the behavior of functions near specific points or as they approach infinity.
3. Explain the derivative as an instantaneous rate of change, develop basic differentiation rules, and compute derivatives of algebraic and trigonometric functions using these differentiation rules.
4. Solve falling body problems and other real world application problems by calculating instantaneous rate of change using differentiation, including using implicit differentiation to solve related rate problems.
5. Analyze and interpret the behavior of functions using derivatives to identify critical numbers, relative extrema, inflection points, and concavity. Solve optimization problems using differentiation techniques.
6. Define and compute indefinite and definite integrals using basic integration techniques, and explain the relationship between differentiation and integration as expressed by the Fundamental Theorem of Calculus.

[1*] Portage Learning college courses are offered by Geneva College, which is accredited by the Middle States Commission on Higher Education and Bushnell University, which is accredited by Northwest Commission on Colleges and Universities. The Faculty Senate of both institutions have vetted and approved the courses as part of their curriculum.

7. Integrate composite function using u-substitution, apply integration techniques to solve application problems and find the average value of a function.
8. Apply definite integrals to find area between two curves, volume of solids of revolution, length of a plane curve, area of a surface of revolution, and work.

*Please see the *Module & Lab Topics* section below for expanded course outcomes.

The MATH 181 student learning outcomes are measured:

Directly by: (1) Module application problems (with instructor feedback)
(2) Adaptive Learning Exercises
(3) Module Exams
(4) Cumulative final exam

Indirectly by an end of course student-completed evaluation survey

Course Delivery: This course is asynchronously delivered online. Contact hours include 50 - 60 hours of reviewed module assignments with instructor feedback and video lectures. There are 10 additional contact hours composed of secure online exams.

Course Progression: It is the policy for all Portage Learning courses that only one (module/final) exam is to be completed within a 48-hour period. Research on the best practices in learning indicates that time is needed to process material for optimal learning. This means that once an exam has been completed, the next exam may not be opened or taken until 48 hours after the submission of the previous module exam. This allows for instructor feedback/class expectations as the student moves through the material. Instructors, like the College, are not available during the weekend; grading, therefore, is M-F and may take up to 72 hours during these days. Also, it is the policy of Portage Learning to support a minimum of 28 days to complete a course; this is not a negotiable time period. Please plan your time accordingly.

Note: Professors reserve the right to reset any exam taken in violation of these guidelines.

Required readings, lectures and assignments: Portage courses do not use paper textbooks. Students are required to read the online lesson modules written by the course author which contain the standard information covered in a typical course. Please note the exam questions are based upon the readings. Video lectures which support each lesson module subject should be viewed as many times as is necessary to fully understand the material.

We do not support the use of outside resources to study, except for the ones listed in the syllabus under "Suggested External References". If you have questions about the material or would like further explanation of the concepts, please contact your instructor.

Module Review Questions: The practice problems within the modules are a part of your final grade, and the module work will be reviewed for completeness (not correctness) by the instructor. Be sure to answer all of the problems, being careful to answer the questions in your own words at all times since this is an important part of adequate preparation for the exams. For problems that require calculations, you must show your work by including the initial set up for the problem and your final answer. Problem sets submitted with only a final answer will not be considered complete. After you answer the practice problems, compare your answers to the solutions provided at the end of the module. If your answers do not match those at the end, attempt to figure out why there is a difference. If you have any questions, please contact the instructor via the Canvas messaging system (see Inbox icon).

Academic Integrity is a serious matter. In the educational context, any dishonesty violates freedom and trust, which are essential for effective learning. Dishonesty limits a student's ability to reach his or her potential. Portage places a high value on honest independent work. We depend on the student's desire to succeed in the program he or she is entering. It is in a student's own best interests not to cheat on an exam or put their work into question, as this would compromise the student's preparation for future work. It is the student's responsibility to review the **Student Handbook** and all policies related to academic integrity. If clarification is necessary, the student should reach out to their instructor for further explanation **before** initiating module one.

Required Computer Accessories: It is recommended that students use a desktop or laptop computer, PC or Mac, when taking the course. Some tablet computers are potentially compatible with the course, but not all features are available for all tablet computers. The latest full version of Google Chrome, Firefox, Edge, or Safari browser is required for the optimal operation of the Canvas Learning Management System. In addition, this course will use the Respondus Lockdown Browser for exams; a strong internet connection is needed. You are also **required to use LockDown Browser with a webcam**, which will record you during an online, nonproctored exam. (The webcam feature is sometimes referred to as "Respondus Monitor.") **Your computer must have a functioning webcam and microphone. Additionally, students will need a photo ID that includes your picture and full name is required. Please note, Chromebooks and tablets (other than iPad) are not compatible on exams using the Lockdown Browser.** Instructions on downloading and installing this browser will be given at the start of the course. We highly recommend using a high-speed Internet connection to view the video lectures and labs. You may experience significant difficulties viewing the videos using a dial-up connection.

For more information on basic system and browser requirements, please reference the following:
Canvas browser and system requirements: https://community.canvaslms.com/t5/Canvas-Basics-Guide/What-are-the-browser-and-computer-requirements-for-Canvas/ta-p/66
Respondus Requirements: https://web.respondus.com/he/lockdownbrowser/resources/
Respondus Monitor Requirements: https://web.respondus.com/he/monitor/resources/

Additional Tools: A built-in **scientific calculator** for the course has been incorporated into the website and can be found in the tool bar above each module and exam page. If you choose to purchase a calculator, keep in mind that you do not need to purchase an expensive calculator as the features you will need are available on basic scientific calculators with a cost of less than $20.

The only calculator that is permitted during an exam is the one that is provided in the course introductory materials and within the exam. It would be wise to familiarize yourself with this calculator and use it for both the practice problems and module problem sets. A tutorial is also provided in the course introductory material. You are allowed to copy and paste your answers from the calculator into the answer boxes. If you have any questions regarding how to input numbers or perform certain calculations, please contact your instructor for assistance before moving forward in the course.

Modules

Module 1: Pre-Calculus Review

1.1 Exponents

1.2 Radicals

1.3 Polynomials

1.4 Factoring

1.5 A Review of Functions

1.6 Function Families

1.7 Graphs of Polynomial Functions

1.8 Trigonometric Functions and The Unit Circle

1.9 Trigonometric Identities

1.10 Logarithms

Module 2: Limits

2.1 What is Calculus?

2.2 Introduction to Limits (Graphing Approach)

2.3 Limit Laws

2.4 Finding Limits Algebraically

2.5 Special Techniques for Finding Limits

2.6 Limits at Infinity (End Behavior of Functions)

2.7 The Squeeze Theorem

2.8 Continuity

2.9 The precise Definition of a Limit

Module 3: Derivatives

3.1 Instantaneous Rate of Change

3.2 Developing the Definition of the Derivative

3.3 Special Cases with the Definition of the Derivative

3.4 Basic Differentiation Rules (constant, power, constant multiple, sine, cosine)

3.5 Product and Quotient Rule

3.6 Derivatives of tangent, cotangent, secant, cosecant

3.7 Higher Order Derivatives

3.8 Derivatives of the Natural Logarithm

3.9 The Chain Rule

3.10 The Chain Rule Combined with other rules

Module 4: Applications of Derivatives

4.1 Derivatives as a Rate of Change

4.2 Finding the Equation of Tangent Lines

4.3 Falling Body Problems

4.4 Implicit Differentiation

4.5 Related Rate Problems (Part 1)

4.6 Related Rate Problems (Part 2)

4.7 Mean Value Theorem for Derivatives and Rolle’s Theorem

Module 5: Additional Applications of Derivatives

5.1 Critical Numbers

5.2 Derivatives and the Shapes of Graphs (First and Second Derivative Tests)

5.3 Absolute Maximum and Minimum

5.4 Applied Optimization Problems (Part 1)

5.5 Applied Optimization Problems (Part 2)

5.6 L'Hopital's Rule

Module 6: Integration

6.1 An Antiderivative

6.2 The Indefinite Integral (Initial Value Problems)

6.3 Area Under the curve as an Infinite Summation

6.4 The Definite Integral

6.5 Properties of The Definite Integral

6.6 Integration by U-substitution

Module 7: Additional Integration Topics

7.1 Change of Variable

7.2 Integration by Guessing

7.3 Falling Body Problems

7.4 Mean Value Theorem for Integrals and Average Value of a Function

Module 8: Application of Integrals

8.1 Area Between Two Curves

8.2 Solids of Revolution: Disks and Washers

8.3 Solids of Revolution: Shells

8.4 Length of a plane curve, surface area of revolution

8.5 Work

Grading Rubric:

Check for Understanding =	1 pt.
8 Module exams = 100 pts. each x 8 =	800 pts.
Problem Sets = 10 pts. each x 8 =	80 pts
Final exam = 200 pts.	200 pts.
Total	1081 pts.

Grading Scale:

96.5% - 100% = A+
92.5% - 96.4% = A
89.5% - 92.4% = A-
86.5% - 89.4% = B+
82.5% - 86.4% = B
79.5% - 82.4% = B-
76.5% - 79.4% = C+
72.5% - 76.4% = C
69.5% - 72.4% = C-
66.5% - 69.4% = D+
62.5% - 66.4% = D
59.5% - 62.4% = D-
0% - 59.4% = F

Suggested External References:

If the student desires to consult a reference for additional information, the following textbooks are recommended as providing complete treatment of the course subject matter.

- Strang and Herman, **Calculus Volume 1**, OpenStax Publishing

NOTE: We do not support the use of outside resources to study, except the ones listed above.

Learning Support Services:

Each student should be sure to take advantage of and use the following learning support services provided to increase student academic performance:

Video lectures: Supports diverse learning styles in conjunction with the text material of each module

Messaging system: Provides individual instructor/student interaction

Tech support: Available by submitting a help ticket through the student dashboard

Accommodations for Students with Learning Disabilities:

Students with documented disabilities may be eligible to receive reasonable accommodations in accordance with the Americans with Disabilities Act (ADA) and applicable federal and state laws.

Documentation Requirements

Documentation must be dated within the past four (4) years and submitted for review.
To initiate a request, students should contact Student Services at **studentservices@portagelearning.edu** to obtain a link to our secure documentation upload site. Please do not email documentation directly, as we are only able to review materials submitted through the secure site to protect your privacy.

Once documentation has been received, the Accommodation Review Committee will evaluate the materials and notify the student of any approved accommodations within seven (7) business days (excluding weekends).

Examples of Approved Accommodations (when supported by documentation) may include:

1. Extended time on examinations
2. Reduced-distraction testing environment (students select their testing location)
3. Closed captioning for video lectures (available to all students)
4. Use of approved memory aids
5. One scheduled break during examinations

Accommodations are determined on an individualized basis following review of appropriate documentation.

One-on-one Instruction:

Each student is assigned to his/her own instructor. Personalized questions are addressed via the student dashboard messaging system.

Online learning presents an opportunity for flexibility; however, a discipline to maintain connection to the course is required; therefore, communication is essential to successful learning. **Check your messages daily.** Instructors are checking messages daily Monday-Friday to be sure to answer any questions that may arise from you. It is important that you do the same so you do not miss any pertinent information from us.

Holidays:

During the following holidays, all administrative and instructional functions are suspended, including the grading of exams and issuance of transcripts.

New Year's Day	MLK Day
Easter	Memorial Day
Juneteenth	Independence Day
Labor Day	Thanksgiving weekend
Christmas Break	

The schedule of holidays for the current calendar year may be found under the Student Services menu at www.portagelearning.edu

Code of Conduct: Students are expected to conduct themselves in a way that supports learning and teaching and promotes an atmosphere of civility and respect in their interactions with others. Verbal and written aggression, abuse, or misconduct is prohibited and may be grounds for immediate dismissal from the program.

This is a classroom; therefore, instructors have the academic freedom to set forth policy for their respective class. Instructors send a welcome e-mail detailing the policy of their class, which students are required to read prior to beginning the course.

Grievances: If a student has a complaint about the coursework or the instructor, the student is advised to first consult the instructor, who will be willing to listen and consider your concern. To file a formal grievance for consideration by the Academic Review Committee, the process must be initiated by requesting an appeal form from academics@portagelearning.edu.

Remediation: At Portage Learning we allow a "one-time" only opportunity to re-take an alternate version of **one** module exam on which a student has earned a grade lower than 70%. This option must be exercised before the final exam is started. If an exam is retaken, the original exam grade will be erased and the new exam grade will become a permanent part of the course grade. However, before scheduling and attempting this retest, the student must resolve the questions they have regarding the material by reviewing both the old exam and the lesson module material. Once ready to attempt the retest of the exam they must contact their instructor to request that the exam be reset for the retest. Remember, any module retest must be requested and completed **before** the final exam is opened.

Note: Exams on which a student has been penalized for a violation of the academic integrity policy may not be re-taken.

Syllabi are subject to change as part of ongoing educational review practices. Students are responsible for accessing and using the most recent version of the course syllabus.