# Course Syllabus

## Math 2413- Calculus I

## Fall 2025

**Catalog Description**: Limits and continuity; the Fundamental Theorem of Calculus; definition of the derivative of a function and techniques of differentiation; applications of the derivative to maximizing or minimizing a function; the chain rule, mean value theorem, and rate of change problems; curve sketching; definite and indefinite integration of algebraic, trigonometric, and transcendental functions, with an application to calculation of areas.

**Prerequisites:** MATH 2412 – Pre-Calculus or equivalent preparation

**Semester Credit Hours:** 4
**Lecture Hours per Week:** 3
**Lab Hours per Week:** 3
**Extended Hours:**1
**Contact Hours per Semester:** 96
**State Approval Code:** 27.0101.59 19

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**Alternate Operations During Campus Closure:** In the event of an emergency or announced campus closure due to a natural disaster or pandemic, it may be necessary for Panola College to move to altered operations. During this time, Panola College may opt to continue delivery of instruction through methods that include, but are not limited to: online learning management system (CANVAS), online conferencing, email messaging, and/or an alternate schedule. It is the responsibility of the student to monitor Panola College's website (www.panola.edu) for instructions about continuing courses remotely, CANVAS for each class for course-specific communication, and Panola College email for important general information.

**Core Components and Related College Student Learning Outcomes**
This course counts as part of the academic requirements of the Panola College Core Curriculum and an Associate of Arts or Associate of Science degree. ☒ Yes ☐No: If no, skip to Instructional Goals.

The items below marked with an X reflect the state-mandated outcomes for this course **IF this is a CORE course**:

☒ Critical Thinking Skills – to include creative thinking, innovation, inquiry and analysis, evaluation and syntheses of information
- ☐ CT1: Generate and communicate ideas by combining, changing, or reapplying existing information
- ☒ CT2: Gather and assess information relevant to a question
- ☒ CT3: Analyze, evaluate, and synthesize information

☒ Communication Skills – to include effective development, interpretation, and expression of ideas through written, oral, and visual communication
- ☒ CS1: Develop, interpret, and express ideas through written communication
- ☐ CS2: Develop, interpret, and express ideas through oral communication
- ☐ CS3: Develop, interpret, and express ideas through visual communication

☒ Empirical and Quantitative Skills – to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions

☒ EQS1: Manipulate and analyze numerical data and arrive at an informed conclusion

☐ EQS2: Manipulate and analyze observable facts and arrive at an informed conclusion

☐ Teamwork – to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal

☐ TW1: Integrate different viewpoints as a member of a team

☐ TW2: Work with others to support and accomplish a shared goal

☐ Personal Responsibility – to include the ability to connect choices, actions, and consequences to ethical decision-making

☐ PR1: Evaluate choices and actions and relate consequences to decision-making

☐ Social Responsibility – to include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities

☐ SR1: Demonstrate intercultural competence

☐ SR2: Identify civic responsibility

☐ SR3: Engage in regional, national, and global communities

**Instructional Goals and Purposes:**
Upon completion of MATH 2413, the student will be able to demonstrate:

1. Competence in solving problems related to lines.
2. Competence in solving problems related to limits and continuity
3. Competence in determining the derivatives of various functions and using derivatives to solve problems in maxima and minima, curvature, graphics, velocity and acceleration.
4. Competence in finding the integral of various functions and using integration to solve problems in area, volume, work, fluid, pressure, mass, moments, centroids, moment of inertia, growth and decay.

**Learning Outcomes:**

Upon successful completion of this course, students will:

1. Develop solutions for tangent and area problems using the concepts of limits, derivatives, and integrals.
2. Draw graphs of algebraic and transcendental functions considering limits, continuity, and differentiability at a point.
3. Determine whether a function is continuous and/or differentiable at a point using limits.
4. Use differentiation rules to differentiate algebraic and transcendental functions.
5. Identify appropriate calculus concepts and techniques to provide mathematical models of real-world situations and determine solutions to applied problems.
6. Evaluate definite integrals using the Fundamental Theorem of Calculus.
7. Articulate the relationship between derivatives and integrals using the Fundamental Theorem of Calculus.

**Course Content:**

A general description of lecture/discussion topics included in this course are listed in the Learning Objectives / Specific Course Objectives sections of this syllabus.

After studying the material presented in the text(s), lecture, laboratory, computer tutorials, and other resources, the student should be able to complete all behavioral/learning objectives listed below with a minimum competency of 70%.

Upon completion of this section, the student will be able to correctly

1. Solve linear, quadratic, rational, radical and absolute value equations and inequalities, using appropriate interval notation to state answer.
2. Write the equations of circles given pertinent information.
3. Identify the center and radius of a circle whose equation is given in standard form or general form.
4. Find the midpoint of a segment, and find the distance between two points in the Cartesian plane.
5. Write the equation of a line given the slope and a point, or two points.
6. Define and identify a function, its domain and range.
7. Evaluate and graph functions, including piecewise and step functions.
8. Perform basic operations with functions, including composition of functions.
9. Given a basic graph of a function, transform it by shifting, reflecting or stretching it.
10. Find the limits of functions using tables and graphing calculators.
11. Find the limits of functions using the strategies for finding limits.
12. Apply the rules of differentiation to find the derivative of a function: the constant rule, power rule, constant multiple rule, sum and difference rules, product and quotient rules, chain rule, and general power rule.
13. Determine whether a function is continuous or discontinuous; determine whether the discontinuities are removable or non-removable.
14. Apply the properties of infinite limits when determining the limit of functions.
15. State and apply the definition of limit.
16. Find the derivative of a function using the definition of derivative (the 4-step limit process).
17. Find the average rate of change, the instantaneous rate of change and the acceleration of the position function.
18. Differentiate a function using implicit differentiation.
19. Solve problems involving related rates.
20. Define extrema and critical number and use the Mean Value Theorem to find the extrema on [a,b].
21. State and apply Rolle's Theorem and the Mean Value Theorem.
22. Define increasing and decreasing functions and use the first derivative test to find relative extrema.
23. Define concavity and point of inflection and use the second derivative test to find the relative extrema and points of inflection.
24. Find the limits of functions as x approaches infinity.
25. Define horizontal asymptote and determine the horizontal asymptotes of a function.
26. Sketch the graph of a function given the first or second derivative; sketch the graph of the first or second derivative given a function.
27. Solve optimization problems by applying unit theorems and definitions regarding extrema.
28. Define anti-derivative and apply basic integration rules to evaluate indefinite integrals.
29. Use sigma notation to write the sum of a finite sequence.

30. Find the area of a region using the limit of the upper and lower sums.
31. Evaluate definite integrals applying appropriate properties.
32. Sketch the region whose area is indicated by a given definite integral.
33. State and apply the first and second Fundamental Theorems of Calculus and the Mean Value Theorem for integrals.
34. Use the Trapezoidal Rule and Simpson's Rule to approximate definite integrals.
35. Find the area of a region between two plane curves.
36. Find the volume of a solid of revolution using the disc and shell methods (and washer method).
37. Find the arc length of a function on a closed interval.
38. Find the area of the surface of revolution.
39. Calculate the work done by a constant and a variable force.
40. Find the moment(s) and center of mass of a linear system and a two-dimensional system.
41. Find the moments and centroid of a planar lamina.

**Extended Hours:**

For each concept course content listed about, 30 minutes of lecture/activity will be required outside of classroom instruction.

**Methods of Instruction/Course Format/Delivery:**

Methods of Instruction/Course Format/Delivery: Methods employed will include Lecture/demonstration, discussion, problem solving, analysis, and reading assignments. Homework will be assigned. Faculty may choose from, but are not limited to, the following methods of instruction:

1. Lecture
2. Discussion
3. Internet
4. Video
5. Television
6. Demonstrations
7. Field trips
8. Collaboration
9. Readings

**Major Assignments/Assessment:**

Faculty may assign both in- and out-of-class activities to evaluate students' knowledge and abilities. Faculty may choose from – but are not limited to -- the following methods attendance, class preparedness and participation. Collaborative learning projects, exams/tests/quizzes, homework, internet, library assignments, readings, research papers, scientific observations, student-teacher conferences, and written assignments.

The Mathematics Department will not accept late work.

**Assessment(s):**

1. Exam per Chapter

2. Comprehensive Final Exam

**Course Grade:**

| **Assignment Weights** | |
|---|---|
| Class Participation | 10% |
| Homework/Quiz Average | 15% |
| Exams | 55% |
| Comprehensive Final Exam | 20% |

**Letter Grades for the Course will be assigned as follows:**

A: 90 < Average < 100

B: 80 < Average < 90

C: 70 < Average < 80

D: 60 < Average < 70

F: 00 < Average < 60

**Texts, Materials, and Supplies:**

- Textbook: Contemporary Calculus by Dale Hoffman (No Purchase Necessary)
- Lumen OHM (No Purchase Necessary)
- Canvas Access

**Other:**

- Courses conducted via video conferencing may be recorded and shared for instructional purposes by the instructor.
- For current texts and materials, use the following link to access bookstore listings: https://www.panolacollegestore.com
- For testing services, use the following link: https://www.panola.edu/student-services/student-support/academic-testing-center
- If any student in this class has special classroom or testing needs because of a physical learning or emotional condition, please contact the ADA Student Coordinator in Support Services located in the Charles C. Matthews Student Center or go to https://www.panola.edu/student-services/student-support/disability-support-services for more information.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook, *The Pathfinder: https://www.panola.edu/* (located at the bottom under students)