

MAT1300_202338_Staging_EMBR_TEM

MAT-1300

2023 05/01/2023 to 04/30/2024 Modified 03/22/2023

Course Description

This year-long course builds on principles of geometry, algebra, trigonometry, and other prior mathematics courses to take students into the world of limits, derivatives, and special computational techniques such as the power rule and differentiation. It is an important prerequisite for many educational programs in engineering and science. The student will also explore topics related to sequences, series, and the fundamental theorem of calculus as well as differential equations. Students will have access to engaging multimedia video lectures, notes pages for each lesson summarizing the video content, practice problems, and assessments. All video lessons include a transcript and closed captioning in English and Spanish.

Rationale

Students are required more and more to have a higher-level background in mathematics before beginning a program of study for engineering and sciences (including medicine). Calculus gives them this edge in being prepared for more difficult college-level courses. It is a logical follow-up course after pre-calculus and trigonometry.

Course Learning Outcomes

- A. The student will investigate and explore calculus topics including limits, derivatives, integrals, differentiation, sequences and series.
- B. The student will perform computations using the Power Rule, Product and Quotient Rules, and the Chain Rule.
- C. The student will evaluate limits, rates of change, derivatives and other calculations using proven calculus principles and skills.
- D. The student will investigate a variety of functions including exponential and logarithmic functions.
- E. The student will use derivatives to find velocity, rates of change, slopes of tangent lines, equations of tangent lines, reciprocal functions, and square root functions.
- F. The student will evaluate and graph trigonometric functions, exponential functions, and logarithmic functions.
- G. The student will explore topics related to higher-order derivatives, linear approximation, and curve sketching.
- H. The student will investigate the basics of integration including the fundamental theorem of calculus, antiderivatives, and practical applications in real life.
- I. The student will have the opportunity to explore paradoxes and special sequences in calculus including Zeno's Paradox, Fibonacci's Number, and the Golden Ratio.

Biblical Integration Outcomes

- A. The student will learn about the fascinating universe that God created and how mathematics displays His power and glory through mathematical principles that govern the natural laws of the universe.
- B. The student will explore how mathematical principles and ideas such as Fibonacci's Number, Euler's Law, and the Golden Ratio are all synchronous with God's handiwork in plant life, building design and other areas of science and math.

Course Resources

See Ember's [Systems Requirements](#) for computer specifications necessary to operate this curriculum.

- Note: Embedded YouTube videos may be utilized to supplement Ember's YouTube videos are the property of the respective content creator, licensed to YouTube for distribution and user access. As a non-profit educational institution, Ember is able to use YouTube video content under the YouTube Terms of Service. For additional information on copyright, please contact the [Jerry Falwell Library](#)

* Course Policies

Types of Assessments

To simplify and clearly identify which policies apply to which assessment, each assessment has been categorized into one of four categories: Lesson, Assignment, Quiz, or Test. Each applicable item on the course Modules page has been designated with an identifier chosen from among these categories. Thus, a Quiz on the American Revolution may be designated by the title, "1.2.W Quiz: The American Revolution."

- **Lesson:** *Any item on the Modules page designated as a "Lesson"*

These include instructional content and sometimes an assessment of that content. Typically, a Lesson will be the day-to-day work that a student completes.

- **Assignment:** *Any item on the Modules page designated as an "Assignment"*

Typical examples of Assignments include, but are not limited to, papers, book reports, projects, labs, and speeches. Assignments are usually something that the student should do his or her best work on the first time.

- **Quiz:** *Any item on the Modules page designated as a "Quiz"*

This usually takes the form of a traditional assessment where the student will answer questions to demonstrate knowledge of the subject. Quizzes cover a smaller amount of material than Tests.

- **Test:** *Any item on the Modules page designated as a "Test"*

This usually takes the form of a traditional assessment where the student will answer questions to demonstrate knowledge of the subject. Tests cover a larger amount of material than Quizzes.

Materials Selection Policy

Ember curates educational materials that are consistent with the school's philosophy; however, the fallen human condition depicted in literature (as in Scripture itself) is not always pleasant. Valuable works sometimes have objectionable or profane elements. Good books provide four (4) recognized values.

- They build godly attitudes and character traits.
- They deepen our social and cultural awareness.
- They strengthen our use of written language.
- They provide a lifelong source of enjoyment and relaxation.

In order to instill these values in students and fulfill the stated objectives of the school, all Ember students are expected to read and study good books on a regular basis. Recognizing that materials designed for one level may not be appropriate for another, three (3) levels of criteria are applied:

- Elementary materials must contain no objectionable material,
- Objectionable elements in sixth through eighth-grade materials must be limited and must serve a specific educational purpose, and
- Objectionable content may be included in high school materials but must be outweighed by positive literary, curricular, and/or Christian values.

The curriculum department has approved required educational materials for students.

Resubmission Policy

Students are expected to submit their best work on the first submission for every Lesson, Assignment, Quiz, and Test. However, resubmissions may be permitted in the following circumstances:

- **Lesson:** Students are automatically permitted two attempts on a lesson. Students may freely resubmit for their first two attempts without the need for teacher approval.

If a student feels that he or she deserves a resubmission on a Lesson, Assignment, Quiz, or Test due to a technical issue such as a computer malfunction, the student should message his or her teacher to make the request. With Ember, the teacher may be a physical school teacher or the student's parent/guardian. The teacher can give another attempt from his or her Canvas account. For more information on how to do this, please review the Ember orientation course.

Schedule

Module 1: Introduction and Limits

- Week 1: Overview and Review
- Week 2: Introduction to Limits
- Week 3: More Limits

Module 2: Limits and Derivatives

- Week 4: Limits and Instantaneous Velocity
- Week 5: Introduction to Derivatives
- Week 6: More Derivatives

Module 3: Rules for Computing Derivatives

- Week 7: Derivative Rules
- Week 8: More Derivative Rules
- Week 9: Derivatives of Trigonometric Functions & Quarter 1 Exam

Module 4: Derivatives and Functions

- Week 10: Exponential and Logarithmic Functions
- Week 11: Implicit Differentiation
- Week 12: Position, Velocity, and More Differentiation

Module 5: Optimization

- Week 13: Optimization Applications
- Week 14: More Optimization and Related Rates
- Week 15: More Related Rates

Module 6: Graphs and Derivatives

- Week 16: Extrema and Concavity
- Week 17: Graphing Using the Derivative
- Week 18: Asymptotes & Quarter 2 Exam

Module 7: Integration

- Week 19: More Asymptotes
- Week 20: Antidifferentiation
- Week 21: Integrating More Functions

Module 8: Area and Motion

- Week 22: Area
- Week 23: Antiderivatives and Motion
- Week 24: Area between Two Curves

Module 9: Indeterminate Forms and Integrating with y

- Week 25: Integrating with Respect to y
- Week 26: L'Hôpital's Rule
- Week 27: Log Functions & Quarter 3 Exam

Module 10: Derivatives of Inverse Functions

- Week 28: Inverse Functions
- Week 29: Trigonometric Functions
- Week 30: Partial Fractions

Module 11: Integration by Parts and Improper Integrals

- Week 31: Integrating by Parts
- Week 32: Improper Integrals
- Week 33: Average Value and Cross- Sectional Volume

Module 12: Solids of Revolution and Differential Equations

- Week 34: Disk and Washer Methods
- Week 35: Differential Equations
- Week 36: Quarter 4 Exam