

# Course Syllabus

## Description:

Study limits, continuity, and differentiation while exploring integrated algebraic, trigonometric, and transcendental functions and the applications of derivatives and integrals.

**Estimated Completion Time:** 2 Semesters

## Major Topics and Concepts:

### Segment I:

#### Module 00: Getting Started

- 00.01 Things to Know
- 00.02 Navigation
- 00.03 Lessons and Assessments
- 00.04 Course Specifics
- 00.05 Online Learning 101
- 00.06 Pace
- 00.07 Academic Integrity

#### Module 01: Functions

- 01.00 Module One Checklist and Pretest
- 01.01 Course Introduction
- 01.02 Introduction to Calculus
- 01.03 Review of Function Terminology and More
- 01.04 Graphing Calculators
- 01.05 Compositions and Transformations of Functions
- 01.06 Some Common Functions
- 01.07 Discussion-Based Assessment or Collaborative Lesson
- 01.08 Module One Practice Test
- 01.09 Module One Test Part 1
- 01.09 Module One Test Part 2

#### Module 02: Limits and Continuity

- 02.00 Module Two Checklist and Pretest
- 02.01 Introduction to Limits
- 02.02 Properties of Limits
- 02.03 Limits Involving Infinity
- 02.04 Continuity
- 02.05 Applications of Limits
- 02.06 Discussion-Based Assessment or Collaborative Lesson
- 02.07 Module Two Practice Test
- 02.08 Module Two Test Part 1
- 02.08 Module Two Test Part 2

#### Module 03: Differentiation

- 03.00 Module Three Checklist and Pretest
- 03.01 The Derivative

- 03.02 Rules of Differentiation
- 03.03 Trigonometric Derivatives and the Chain Rule
- 03.04 Inverse Functions
- 03.05 Exponential and Logarithmic Functions
- 03.06 Derivatives of Exponential, Logarithmic, and Inverse Trig Functions
- 03.07 Implicit Differentiation
- 03.08 Discussion-Based Assessment or Collaborative Lesson
- 03.09 Module Three Practice Test
- 03.10 Module Three Test Part 1
- 03.10 Module Three Test Part 2

#### **Module 04: Applications and Derivatives**

- 04.00 Module Four Checklist and Pretest
- 04.01 Analyzing Functions Part I: Curve Sketching
- 04.02 Analyzing Functions Part II: Maximums and Minimums
- 04.03 Applied Maximum and Minimum Problems
- 04.04 Distance, Velocity, Acceleration, and Rectilinear Motion
- 04.05 Related Rates
- 04.06 The Mean-Value Theorem and L'Hôpital's Rule
- 04.07 Linearization
- 04.08 Discussion-Based Assessment or Collaborative Lesson
- 04.09 Module Four Practice Test
- 04.10 Module Four Test Part 1
- 04.10 Module Four Test Part 2
- 04.11 Segment One Practice Exam
- 04.12 Segment One Exam Part 1
- 04.12 Segment One Exam Part 2

#### **Segment II**

#### **Module 05: Integration**

- 05.00 Module Five Checklist and Pretest
- 05.01 Area Approximation and Riemann Sums
- 05.02 Introduction to the Definite Integral
- 05.03 The Fundamental Theorem of Calculus
- 05.04 Integrals and Antiderivatives
- 05.05 Integration by Substitution
- 05.06 The Definite Integral
- 05.07 Discussion-Based Assessment or Collaborative Lesson
- 05.08 Module Five Practice Test
- 05.09 Module Five Test Part 1
- 05.09 Module Five Test Part 2

#### **Module 06: Applications of Integrals**

- 06.00 Module Six Checklist and Pretest
- 06.01 Finding the Area Under and Between Curves
- 06.02 Volume by Discs (Slicing)
- 06.03 Average Value of a Function and Rectilinear Motion Revisited
- 06.04 Discussion-Based Assessment or Collaborative Lesson
- 06.05 Module Six Practice Test

- 06.05 Module Six Practice Test
- 06.06 Module Six Test Part 1
- 06.06 Module Six Test Part 2

### **Module 07: Differential Equations and More Riemann Sums**

- 07.00 Module Seven Checklist and Pretest
- 07.01 Differential Equations—An Introduction
- 07.02 Initial Value Problems and Slope Fields
- 07.03 Numerical Approximation Methods with Integrals
- 07.04 Discussion-Based Assessment or Collaborative Lesson
- 07.05 Module Seven Practice Test
- 07.06 Module Seven Test Part 1
- 07.06 Module Seven Test Part 2

### **Module 08: Supplemental Topics**

- 08.00 Module Eight Checklist and Pretest
- 08.01 Exploring the Graphs of  $f$ ,  $f$  Prime, and  $f$  Double Prime
- 08.02 Relative Rates of Growth
- 08.03 Using Calculus with Data in a Table
- 08.04 Functions Defined by Integral
- 08.05 Discussion-Based Assessment or Collaborative Lesson
- 08.06 Module Eight Practice Test
- 08.07 Module Eight Test Part 1
- 08.07 Module Eight Test Part 2
- 08.08 Segment Two Practice Exam
- 08.09 Segment Two Exam Part 1
- 08.09 Segment Two Exam Part 2

### **Course Assessment and Participation Requirements:**

To achieve success, students are expected to submit work in each course weekly. Students can learn at their own pace; however, “any pace” still means that students must make progress in the course every week. To measure learning, students complete self-checks, practice lessons, multiple choice questions, projects, discussion-based assessments, and discussions. Students are expected to maintain regular contact with teachers; the minimum requirement is monthly. When teachers, students, and parents work together, students are successful.