Unit 4: Integration

Content Area: **Mathematics**
Course(s): **Advanced Placement Calculus**
Time Period: **February**
Length: **4 weeks**
Status: **Published**

Enduring Understandings:

- Derivatives and anti-derivatives have an inverse relationship to each other.
- Students may not understand what the integral is actually used for.
- Students may occasionally use differentiation rules when integrating.
- The anti-derivative has both theoretical and real life applications
- The area under the curve is the geometric meaning of anti-derivatives.

Essential Questions:

- How are area under the curve and the definite integral related?
- How are the properties of definite integrals related to the Riemann sum definition?
- How are the rules for differentiation used to develop the basic rules of integration?
- How can one apply numerical techniques to compute an integral without knowing the associated antiderivative?
- How can we use the measure of area under a curve to discuss net change of a function over time?
- How is the anti-derivative related to the accumulation function?

Lesson Titles:

- Basic properties of definite integrals (examples include additivity and linearity).
- Definite integral as a limit of Riemann sums.
- Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval:
- Evaluate indefinite integrals using power rule
- Evaluate integrals using u-substitution
- Find the constant of integration given a particular solution
- Interpretations and properties of definite integrals
- Solve differential equations using integration
- Use of the Fundamental Theorem to evaluate definite integrals.
- Use of the Fundamental Theorem to represent a particular antiderivative,
- Use the Fundamental Theorem of Calculus to the analytical and graphical analysis of functions so defined.

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Inter-Disciplinary Connections:

LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LA.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.WHST.11-12.2.D	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
LA.WHST.11-12.6	Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Blooms Analysis - Break down objects or ideas into simpler parts and find evidence to support generalizations
- Blooms Application - Apply Knowledge to actual situations
- Blooms Evaluation - Make and defend judgments based on internal evidence or external criteria
- Blooms Knowledge - Remember previously learned information
- Blooms Synthesis - Compile component ideas into a new whole or propose alternative solutions
- Intro. basic integration methods
- Intro. integration by parts
- Intro. integration by substitution
- Intro. integration of definite integrals by substitution
- intro. integration of definite integrals using geometric formulas
- intro. integration of indefinite integrals using FTC
- Intro. over and under estimations
- Intro. Right, left, and middle rectangular approx.
- intro. simpson's theorem

- Intro. squeeze theorem
- Intro. trapezoidal approximations
- Provide individual activity
- Provide real world examples
- Provide team work activity
- review homework
- review vocabulary that is associated with this unit

Modifications

Formative Assessment:

- AP style multiple choice
- Pair share
- Partner answer/analyze questions
- Pass out of class
- Pass out of class: find the mistake in the differential equation
- pass out of class: particular solutions
- warm up: matching functions to solutions

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios

Benchmark Assessment

Skills-based assessment- math practice

Summative Assessment:

- AP Free response Questions
- AP practice tests
- Individual Assignment
- Marking Period Assessment
- performance tasks
- Project
- Quiz: definite integrals
- Quiz: Indefinite integrals
- Review game
- Unit test

Resources & Materials:

- AP sample Questions
- data investigations
- Establish a set of general strategies for student independence and self-evaluation
- Evoke student participation from their seats and at the board
- Independent/Cooperative learning explorations
- Powerpoint lessons
- Smartboard Lessons