Unit 3: Applications of the Derivative

Content Area: **Mathematics**
Course(s): **Advanced Placement Calculus**
Time Period: **November**
Length: **6 weeks**
Status: **Published**

Enduring Understandings:

- Students will mix up concave up and concave down when using tables
- The derivative has both theoretical and real life applications
- The derivative provides useful information about the behavior of functions and the shapes of graphs.
- Understanding the rate of change of a function allows you to predict future behavior.

Essential Questions:

- How can the derivative be used to solve optimization problems?
- How do rates of change relate in real-life settings?
- What does the derivative tell us?

Lesson Titles:

- Analysis of curves, including the notions of monotonicity and concavity.
- Corresponding characteristics of the graphs of ƒ, ƒ′, and ƒ″.
- Geometric interpretation of differential equations via slope fields and the
- including velocity, speed, and acceleration
- Interpretation of the derivative as a rate of change in varied applied contexts,
- Modeling rates of change, including related rates problems.
- Optimization, both absolute (global) and relative (local) extrema
- Points of inflection as places where concavity changes.
- relationship between slope fields and solution curves for differential equations.
- Relationship between the concavity of ƒ and the sign of ƒ″.
- Use of implicit differentiation to find the derivative of an inverse function

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.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
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.RST.11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

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. to conic related rates
- Intro. to connections between f(x) and f'(x)
- Intro. to connections between f(x), f'(x), and f''(x)
- intro. to optimization
- intro. to pythagorean related rates
- intro. to related rates
- intro. to velocity and acceleration connections
- 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: related rates
- warm up: matching functions to graphs

Alternate Assessments

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 task
- Project
- Quiz related rates
- Quiz: extrema
- Review game
- Test optimization and related rates
- Test: extremes

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