

Unit 2: Derivatives

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

Enduring Understandings:

- That differentiation implies continuity, but continuity does not imply differentiation.
- The derivative is a key element connecting the concepts of position, velocity, and acceleration in physics.
- The derivative is one of the two central concepts of calculus.

Essential Questions:

- How is the average rate of change related to the instantaneous rate of change?
- How is the derivative related to the tangent line to a curve?
- What is the connection between differentiability and continuity?
- Why is the derivative important?

Lesson Titles:

- Approximate rate of change from graphs and tables of values.
- Chain rule and implicit differentiation.
- Corresponding characteristics of graphs of f and f' .
- Corresponding characteristics of the graphs of f , f' , and f'' .
- Derivative as a function
- Derivative at a point
- Derivative rules for sums, products, and quotients of functions
- Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.
- Instantaneous rate of change as the limit of average rate of change
- Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
- Points of inflection as places where concavity changes
- Relationship between the concavity of f and the sign of f'' .
- Relationship between the increasing and decreasing behavior of f and the sign of f' .
- Second derivatives
- Slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents
- Tangent line to a curve at a point and local linear approximation

- The Mean Value Theorem and Rolle's Theorem and their geometric interpretations

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.11-12.3	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.9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
LA.WHST.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
LA.WHST.9-10.2.D	Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
LA.WHST.9-10.2.E	Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.

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. acceleration and particle motion
- Intro. chain rule to find a derivative
- intro. derivative of trig functions
- intro. derivatives of inverse functions
- intro. instantaneous rate of change
- Intro. limit definition of a derivative
- Intro. motion along a line activity
- Intro. particle motion along a horizontal line

- Intro. power rule
- Intro. product rule and quotient rule to find a derivative
- intro. slopes of inverse functions
- Intro. velocity webquest
- 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: chain rule
- warm up: find the mistake
- warm up: Halloween derivative/function matching

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios

Benchmark Assessments

Skills-based assessment- math practice

Summative Assessment:

- AP Free response Questions
- AP practice tests
- Individual Assignment
- Marking Period Assessment
- performance task
- Project
- Quiz on basic differentiation rules
- Quiz on F , $F'(x)$ and $F''(x)$ connections
- Review game
- Test on Differentiation
- Test on first and second derivative tests

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