Unit 3: Derivatives

Content Area: **Mathematics**
Course(s): **Honors Calculus**
Time Period: **November**
Length: **8 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:

- • Points of inflection as places where concavity changes
- Approximate rate of change from graphs and tables of values.
- Chain rule and implicit differentiation.
- Corresponding characteristics of graphs of ƒ and ƒ'.
- Corresponding characteristics of the graphs of ƒ, ƒ', and ƒ''.
- 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.
- Relationship between the concavity of ƒ and the sign of ƒ''.
- Relationship between the increasing and decreasing behavior of ƒ and the sign of ƒ'.
- 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.11-12.1	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.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
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.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

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. chain rule to find a derivative
- intro. derivative of trig functions
- intro. derivatives of inverse functions
- intro. derivatives of inverse trig functions
- intro. derivatives of natural log and base e
- intro. instantaneous rates of change

- Intro. motion along a line activity
- Intro. particle motion along a horizontal line
- Intro. power rule
- Intro. product and quotient rule to find a derivative
- 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:

- Pair share
- Partner answer/analyze questions
- Pass out of class
- pass out of class: chain rule
- warm up: derivative/function matching
- warm up: find the mistake

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Benchmark Assessment

Skills-based assessment- math practice

Summative Assessment:

- 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:

- Calculus: Graphical, Numerical, Algebraical, by Finney, Demana and Kennedy
- 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