Unit 4: Applications of the Derivative

Content Area: **Mathematics**
Course(s):   **Honors Calculus**
Time Period: **January**
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 f, f', and f''.

- 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 f and the sign of f''.

- 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.11-12.2	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.
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.

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. connections between $f(x)$, $f'(x)$, and $f''(x)$
- intro. connections between graphs of $f(x)$ and $f'(x)$
- intro. connections between velocity and acceleration
- intro. intervals of concavity and points of inflection
- intro. intervals of increase and decrease, max, and min
- intro. optimization
- intro. related rates
- Provide individual activity
- Provide real world examples
- Provide team work activity

- review homework
- review vocabulary that is associated with this unit

Modifications

Formative Assessment:

- moving in line activity
- Pair share
- Partner answer/analyze questions
- Pass out of class
- pass out of class: optimization
- Pass out of class: related rates
- warm up: matching functions to graphs

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

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
- graphing calculator activities
- Independent/Cooperative learning explorations
- Powerpoint lessons
- Smartboard Lessons