Unit # 3: Applications of Differentiation

Content Area: **Mathematics**
Course(s): **AP Calculus AB, AP Calculus BC**
Time Period: **Semester 1 & 2**
Length: **3 weeks**
Status: **Published**

Standards

MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.9-12.4.1.12 C.1	Recognize the limitations of estimation, assess the amount of error resulting from estimation, and determine whether the error is within acceptable tolerance limits.

Enduring Understandings

Students will understand how to find extreme points of a function.

Students will extend graphical analysis to incorporate concepts from calculus.

There are different methods of differentiation that should be applied based on the type of expression.

Analysis of the critical elements of functions is essential to calculus.

Functions can be analyzed graphically by their limiting behavior and rates of change.

Students will be able to apply the meaning of extreme points of a function in contexts such as business optimization problems.

Students will understand the conditions needed in order to apply the Extreme Value Theorem and the Mean Value Theorem.

They will be able to compare and contrast initial conditions given to decide if either theorem is applicable.

Breaking down the conditions in application problems to decide which theorem may or may not be used will also be assessed.

Essential Questions

What are the strategies used to find the derivatives of non algebraic functions?

How would you find the derivative of non functions?

What are the relationships between a function, its inverse and derivative?

How do you use the derivative to optimize a function?

How do you use linearization and differentials to estimate values of a function?

How do functions relate to a different variable such as time?

What are the uses of the Extreme Value Theorem?

What can the Mean Value Theorem guarantee for us?

Knowledge and Skills

- Find the slope of the tangent line to a curve at a point.
- Understand the relationship between differentiability and continuity
- Find the instantaneous velocity of a falling object.
- Relate higher order derivatives with physics applications.
- Identify implicit and explicit function.
- Differentiate implicit functions.
- Use implicit differentiation to find the slope of a tangent line to a curve.
- Find a related rate.
- Use related rates to solve real life problems.
- Solving differential equations.
- Discuss the conditions need to apply theorems involving differentiability and continuity such as the Mean Value Theorem or the Extreme Value Theorem.
- To understand when each theorem is to be used.
- To compare and contrast when it is appropriate to use which theorem.
- To recognize when to use which theorem within various FRQs.
- Evaluate limits using L'Hopital's Rule.

Transfer Goals

Recognize and solve practical or theoretical problems involving mathematics, including those for which the solution approach is not obvious, by using mathematical reasoning and strategic thinking.

In this unit students will be able to implement various methods of deriving functions, as well as apply them to real life contexts.

Resources

Calculus Graphical, Numerical, Algebraic by Finney

Online resources which include, but are not limited to: AP Classroom, Desmos, Class Kick, Delta Math, and Math XL.