Unit # 2: The Derivative

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

Standards

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
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

The tangent line problem leads to the formal definition of a derivative.

The derivative tells us the instantaneous rate of change for a function. The instantaneous rate of change of a function is the slope of the tangent line.

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

The derivative of a function can be used as a problem solving tool.

Essential Questions

How are limits related used to understand and evaluate rates of change?

How did I determine derivatives without Calculus and how do I use Calculus?

What are important properties that can be used to find a derivative?

How do we find the derivative of a logarithmic, exponential or other trancendental function?

Knowledge and Skills

- Find the slope of the tangent line to a curve at a point.
- Use the limit definition to find the derivative of a function.
- Understand the relationship between differentiability and continuity.
- Find the derivative of a function using the constant rule.

- Find the derivative of a function using the power rule.
- Find the derivative of a function using the constant multiple rule.
- Find the derivative of a function using the sum/difference rule.
- Take derivatives involving sine and cosine.
- Find the instantaneous velocity of a falling object.
- Use the product rule for finding derivatives.
- Use the quotient rule for finding derivatives.
- Differentiate all trigonometric functions.
- Take higher order derivatives.
- Relate higher order derivatives with physics applications.
- Differentiate using the chain rule.
- 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.

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.

Rates of change can apply to a variety of fields.

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.