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**Coal City Unit District #1**  
**AP Calculus**  
**Math Curriculum**

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**MA.APC:1 Students will demonstrate an understanding of limits and continuity.**

- MA.APC:1-1 Find one-sided and two-sided limits of a function at a specific point in a variety of methods. (e.g. graphically, algebraically, by definition)
- MA.APC:1-2 Determine the end behavior of functions (e. g. rational, exponential) using limits.
- MA.APC:1-3 Determine if a function is continuous at a point or on an interval.
- MA.APC:1-4 Use a graphing calculator to give the appropriate delta for a given epsilon based on the precise definition of a limit.
- MA.APC:1-5 Use L'Hôpital's rule to solve indeterminate forms of limits.
- MA.APC:1-6 Create a function by drawing a graph or using function notation (e.g.  $f(x) = \sin x$ ) given information about the function (e.g. values of the function at given points, values of limits at particular values of  $x$ , vertical and horizontal asymptotes).

**MA.APC:2 Students will demonstrate knowledge of rates of change and derivatives.**

- MA.APC:2-1 Recognize the different forms of the definition of a derivative and use it to find the derivative of a function.
- MA.APC:2-2 Use differentiation rules (power, sum and difference, product and quotient, chain) to find derivatives.
- MA.APC:2-3 Find the equation of the line tangent to a curve at a given point.
- MA.APC:2-4 Find derivatives of trigonometric functions.
- MA.APC:2-5 Find derivatives of inverse trigonometric functions.
- MA.APC:2-6 Find derivatives of logarithmic and exponential functions.
- MA.APC:2-7 Find derivatives of hyperbolic functions.
- MA.APC:2-8 Find the average rate of change and instantaneous rate of change of a function.
- MA.APC:2-9 Find the derivative of a function that is defined implicitly.
- MA.APC:2-10 Find higher order derivatives.
- MA.APC:2-11 Use the equation of a tangent line to approximate values of a function (Linear Approximation).
- MA.APC:2-12 Solve related rate problems using derivatives.

**MA.APC:3 Students will use derivatives to analyze the graphs of functions.**

- MA.APC:3-1 Find local (relative) extrema of a function.
- MA.APC:3-2 Find global (absolute) extrema of a function.
- MA.APC:3-3 Use derivatives to determine where a function is increasing and decreasing.
- MA.APC:3-4 Use derivatives to determine where a function is concave up and concave down.
- MA.APC:3-5 Find inflection points of a function.
- MA.APC:3-6 Find information about a function's derivative or second derivative given the graph of the function and vice-versa.

**MA.APC:4 Students will demonstrate knowledge of integrals.**

- MA.APC:4-1 Approximate area using Riemann sums by hand and using a calculator program.
- MA.APC:4-2 Evaluate a definite integral by a variety of methods (Fundamental Theorem of Calculus, finding area, etc.).
- MA.APC:4-3 Find a specific antiderivative using initial conditions.
- MA.APC:4-4 Find the average value of a function over a given interval.
- MA.APC:4-5 Find the antiderivative of a function using a variety of methods. (e.g. u-substitution, integration by parts, etc.)
- MA.APC:4-6 Construct a slope field of a differential equation or match a slope field to its appropriate function.
- MA.APC:4-7 Solve separable differential equations.
- MA.APC:4-8 Use integrals to set up and solve problems involving rates of change.

**MA.APC:5 Students use integrals to solve problems involving area and volume.**

- MA.APC:5-1 Find area between the x-axis and a curve or between two curves.
- MA.APC:5-2 Find area enclosed by intersecting curves.
- MA.APC:5-3 Find volume of solids with known cross sections.
- MA.APC:5-4 Find volume of solids of revolution using the disk and/or shell method.

**MA.APC:6 Students will demonstrate knowledge of basic theorems of calculus.**

- MA.APC:6-1 State and/or apply the Intermediate Value Theorem.
- MA.APC:6-2 State and/or apply the Mean Value Theorem.
- MA.APC:6-3 State and/or apply the Fundamental Theorem of Calculus.