Calculus CP Curriculum

Calculus is generally the last step in the study of college preparatory mathematics. The course begins with a review of numerous topics that are used heavily in Calculus. The review will consist of topics that were learned in Pre-Calculus, including Trigonometry. The remainder of the course will focus on Calculus concepts, such as limits, derivatives, applications of derivatives, integration, and applications of integration. A detailed explanation of the concepts in Calculus is below.

Review of key prerequisite concepts in preparation for Calculus:
This unit will review Pre-Calculus topics, including finding x-intercepts and y-intercepts, solving equations, solving systems of equations, writing and solving equations for relations and real-life situations, graphing parent functions and their transformations, graphing piecewise functions, evaluating trigonometric functions and inverse trigonometric functions, converting between radians and degrees, solving equations involving trigonometric functions, graphing trigonometric functions, writing and solving equations of trigonometric functions and real-life situations, memorization of the Unit Circle and evaluating trigonometric functions from the Unit Circle.

Limits:
This unit will explain what a limit is and how to evaluate a limit graphically, numerically, and analytically. Additionally, this unit discusses continuity of a function and one-sided limits. Lastly, this unit includes an explanation of how to evaluate infinite limits and limits at infinity.

Differentiation:
This unit will show what the definition of a derivative is and how to use the limit definition of derivative to find the slope of the tangent line. Additionally, this unit will show how to differentiate using the power rule, product rule, quotient rule, chain rule, and implicit differentiation. The unit will also show how to find slope, write equations of tangent lines, and find horizontal tangents. This unit will also explain applications of derivatives, such as real life problems dealing with the position function and related rates problems.

Logarithmic, Exponential, and Other Transcendental Functions:
This unit will explain how to find an inverse function and how to prove that two functions are inverses both algebraically and graphically. The unit will also teach how to find critical points and intervals of increase or decrease. Additionally, the unit will explain how to graph, rewrite, evaluate, and solve exponentials and logarithms. Lastly, the unit will contain an explanation of how to differentiate logarithmic, exponential, and inverse trigonometric functions, including implicit differentiation, writing equations of tangent lines, and finding horizontal tangents.

Applications of Derivatives:
This unit will show how to finding absolute extrema in an interval and how to apply Rolle's Theorem and the Mean Value Theorem. Additionally, the unit will describe how to find intervals of increase and decrease, relative extrema, intervals of concavity, inflection points, and vertical, horizontal, and oblique asymptotes to enable accurate curve sketching.

Integration:
This unit will show how to approximate the area under the curve using upper, lower, and midpoint sums in addition to the trapezoidal rule and how to approximate the area under the curve using Riemann Sum. It will also show how to find the area of a bounded region using a definite integral, how to apply properties of definite integrals, how to integrate rational functions using integration formulas, and how to solve differential equations. The unit will also explain the process of integration using u-substitution, including how to integrate trigonometric, logarithmic, exponential, and inverse trigonometric functions. The unit will also describe the Fundamental Theorem of Calculus to find the value of definite integrals, finding the average value of a function, applying the Mean Value Theorem for Integrals, and applying The Second Fundamental Theorem of Calculus.