

Information for Course Syllabus

Name of Course: AP Calculus BC

Grade Level: 10-12

School: ORHS

Major Assignments: None

Field Trips: None

How can parents access instructional materials? Canvas

AP Calculus BC

2021-2022

Term 1

Functional Analysis Unit	Represent functions numerically, graphically, algebraically and verbally.
	Classify and graph the elementary functions: power, root, polynomial, rational, algebraic, and transcendental (exponential, logarithmic, trigonometric and inverse trigonometric).
	Transform functions by shifting, stretching and reflecting.
	Analyze the differences in graphs $f(x)$, $f(x)$, and $ f(x) $.
	Define inverse functions and form function compositions.
	Analyze and graph planar curves including those given in parametric form, polar form and vector form.

Limits and Continuity Unit	Calculate limits using algebra.
	Estimate limits from graphs or tables of data.
	Determine asymptotic behavior graphically and by using infinite limits analysis.
	Compare both relative magnitudes of functions and their rates of change.
	Determine the continuity of a function at a point.
	Apply graphical interpretations of continuity as in the Intermediate Value Theorem and the Extreme Value Theorem.

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Term 1

Differentiation Unit	Define the derivative as a limit of the difference quotient.
	Interpret the derivative as an instantaneous rate of change.
	Relate the concepts of differentiability and continuity.
	Find the slope of a curve at a point and use it to write an equation of a tangent line if one exists.
	Use the tangent line as a linear approximation and graphically extend the concept of differentiability to local linearity.
	Approximate rate of change from graphs and data.
	Connect concepts of average vs. instantaneous rates of change and interpret verbally.
	Use differentiation rules for sums, products, quotients and compositions involving the elementary functions (power, exponential, logarithmic, trigonometric) of single variable calculus.
	Differentiate implicitly defined functions.
	Differentiate parametric, polar and vector functions.

Applications of Differentiation Unit	Use $f'(x)$ and $f''(x)$ to analyze both the local and global behavior of the graph of $f(x)$, including characteristics such as monotonicity, concavity, extrema and points of inflection.
	Find corresponding relationships among the graphs of $f(x)$, $f'(x)$, and $f''(x)$.
	Use the Mean Value Theorem and know its geometric consequences.
	Optimize, finding both absolute and relative extrema.
	Model rates of change, including related rates.
	Use the derivative in the study of motion: speed, velocity and acceleration for elementary functions and for planar curves which are given in parametric, polar or vector form.

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Term 2

Integration Unit	Compute Riemann sums using left, right and midpoint evaluation points.
	Investigate upper and lower Riemann sums.
	Recognize the definite integral as a limit of Riemann sums over equal subdivisions.
	Interpret the definite integral of the rate of change of a quantity over an interval as the change of the quantity over the interval.
	Use basic properties of definite integrals.
	Understand the basic premise of the Fundamental Theorem of Calculus, that is, integration is antidifferentiation.
	Use the Fundamental Theorem of Calculus to evaluate definite integrals.
	Connect both the concept of accumulation and the analytical features of the Fundamental Theorem of Calculus in interpreting the graphs of integral functions.
	Find antiderivatives analytically including a substitution of variables technique including change of limits for definite integrals.
	Use Riemann and trapezoidal sums to approximate definite integrals of functions represented algebraically, geometrically and by tables of values.
Antidifferentiate using integration by parts and partial fractions techniques.	

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Term 3

Applications of Integration Unit	Use integrals to model physical, social or economic situations.
	Compute the area of a region.
	Compute volumes of solids of revolution and volumes of solids with known cross sections.
	Compute the distance traveled by a particle along a line.
	Determine the average value of a function over an interval and understand the geometric interpretation of average value.
	Use the integral of a rate of change to give accumulated change.
	Use data and Riemann summing to approximate definite integrals.
	Compute arc length (function or parametric).
	Compute polar area.

Differential Equations Unit	Write equations involving derivatives from verbal descriptions (and vice versa).
	Find specific antiderivatives using boundary conditions.
	Solve separable differential equations and use them in modeling, such as exponential growth.
	Interpret differential equations geometrically via slope fields.
	Numerically approximate solutions to differential equations using Euler's Method.
	Solve logistic differential equations and use them in modeling.

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Term 3

Series and Polynomial Approximations Unit	Compute limits using L'Hospital's Rule.
	Evaluate improper integrals (as limits of definite integrals).
	Define a series as a sequence of partial sums.
	Review geometric series and applications and the harmonic series.
	Determine convergence or divergence of a series of constants using the Integral Test, p-Series Test, Ratio Test, Comparison Tests and the Alternating Series Test.
	Interpret terms of a series as areas of rectangles and their relationship to improper integrals.
	Determine error bound in the sum of an alternating series.
	Write Taylor and Maclaurin Series for functions.
	Understand and use graphical convergence of the Taylor and Maclaurin series.
	Manipulate Taylor Series and use substitution, differentiation and antidifferentiation techniques to form new series from old series.
	Find the radius and interval of convergence of power series.
	Find the LaGrange error bound for Taylor polynomials.

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Term 4

AP Exam Review

Advanced Topics