Unit One: Prerequisites to Calculus: Ch. 1 (20 Days)

Big Ideas: Lines, Functions, Exponential Functions, Logarithmic Functions and Trigonometric Functions

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Topics	Assessments	Standards(All from College Board)
1. Lines a) Slopes b) 3 forms c) Parallel and Perp. 2. Functions a) Domain, Range b)Transformations c)Even, Odd and Symmetry (optional) d)Piecewise (optional) e)Composite 3. Exponential Functions a) Euler's b) Growth and Decay (Exclude Unit 1.4 - Parametric functions) 4. Logarithmic Functions a)1-1 b)Inverses (optional) c) Solving for Y 5. Trig functions a) Period, Amplitude, and transformations b)Unit Circle c) Trig Identities	1. Homework is assigned for each section in Unit 1 (excluding 1.4). 2. 1-2 quizzes (lines, domain and range, and unit circle) and are generally given to check understanding. 3. Unit 1.1-1.3 Test and a Unit 1.5-1.6 Test	I. Functions, Graphs, and Limits a)Analysis of graphs.

Unit Two: Limits and Continuity: Ch. 2 (22 Days)

Big Ideas: Average vs. Instantaneous Rates, Limits, Continuity, Rates of change

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Topics	Assessments	Standards (CB)
1. Average vs. Instantaneous velocity a) Secant vs. Tangent slope b) Connect to limit def. of tangent 2. Definition of a limit a) Graphical, numerical and algebraic b) Properties c) Limits involving infinity 1. Vertical and Horiz. asymptotes 2. End Behavior models 3. Continuity a) at a point and properties b) Proving continues c) Types and identify d) Intermediate Value Theorem 4. Rates of Change a) Slope of a curve (limit def.) b) Normal Lines	1. Homework is assigned for each section in Unit 2. 4 worksheets on limits, continuity, slope of a curve and IVT are given. 2. 2-3 quizzes (limits, continuity and slope definition) are generally given to check understanding. 3. Unit 2 test (Free Response and MC)	Limits of functions (including one-sided limits) a) An intuitive understanding of the limiting process. b) Calculating limits using Algebra c) Estimating limits from graphs or tables of data Asymptotic and unbounded behavior a) Understanding asymptotes in terms of graphical behavior b) Describing asymptotic behavior in terms of limits involving infinity c) Comparing relative magnitudes of functions and their rates of change. Continuity as a property of functions a) An intuitive understanding of continuity b) Understanding continuity in terms of limits c) Geometric understanding of graphs of cont. functions Slope of a curve at a point

Unit Three: Derivatives: Ch. (18-20 Days)

Big Ideas: Definition of Derivative, Differentiability, Rules for diff., Velocity and other rates, Der. of Trig.

Topics	Assessments	Standards (CB)
1. Definition of Derivative a) Notation b) Graphical, numerical and algebraic c) Instantaneous rate of change d) Relationship between f and f' 2. Differentiability a) types and where it fails b) Local linearity c) Intermediate Value Theorem 3. Rules for differentiation a) power, sum, diff, product, quotient b) second and higher order derivatives 4. Velocity and other rates a) displacement, ave. velocity, inst. velocity, acceleration, ave. accel., (jerk is optional) 5. Derivative of trig functions 6. L'Hopitals rule 7. Derivatives on calculator	1. Homework is assigned for each section in Unit 3. Handout for Rules given for extra pract. 2. 3 quizzes (Definition, rules and rates) are generally given to check understanding. 3. Firecracker Frank project with Speed kills handout. 4. Unit 3 test (Free Response and MC) 5. Connecting f and f' activity (We belong together)	Derivatives a) Concept of the derivative b) Derivative presented graphically, numerically, and analytically. c) Derivative interpreted as an instantaneous rate of change. d) Derivative defined as the limit of the difference quotient. e) Relationship between differentiability and continuity. Derivative at a point a) Slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents. b) Tangent line to a curve at a point and local linear approximation. c) Instantaneous rate of change as the limit of average rate of change. d) Approximate rate of change from graphs and tables of values. Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.

		L'Hospital's Rule, including its use in determining limits and convergence of improper integrals and series-

Unit Four: More Derivative types (Ch. 4) (18-20 Days)
Big Ideas:Chain Rule, Implicit Diff., Der. of Inverse Trig., Der. of Exp. and Log Functions

Topics	Assessments	Standards
1. Chain Rule (Derivative of Composite functions) a. Outside-Inside Rule b. Repeated use of chain rule c. Power chain rule 2. Implicit Differentiation a. Process b. Higher order derivatives using implicit differentiation 3. Derivatives of Inverse Trigonometric Functions 4. Derivatives of Exponential and Logarithmic Functions	1. Homework is assigned for each section in Unit 4. Handout for Chain Rule and Implicit. 2. 1-2 quizzes (Chain and Implicit) are generally given to check understanding. 3. Unit 4 test (Free Response and MC)	Computation of derivatives 1.Chain rule and implicit differentiation. 2. Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions. 3. Use of implicit differentiation to find the derivative of an inverse function

- End of 1st Semester

Unit Five: Applications of Derivatives: Ch. 5.1-5.3 (17 Days)
Big Ideas: Extreme Values, Mean Value Theorem, Connecting f and f'

Topics	Assessments	Standards
1. Extreme Values of functions a) Absolute and Relative Extrema b) Extreme Value Theorem 2. Mean Value Theorem a) Physical interpretation b) Increasing and Decreasing functions 3. Connecting f and f' a) First derivative test b) Concavity and f" c) Points of inflection d) Second derivative test e) using f' and f" to graph f	1. Homework is assigned for each section in Unit 5.1-5.3. Handout for Extrema and Connecting f and f' activity. 2. 1-2 quizzes (Extreme Values) are generally given to check understanding. 3. Unit 5 test (Free Response and MC)	Derivative as a function a) Corresponding characteristics of graphs of ƒ and ƒ·. b) Relationship between the increasing and decreasing behavior of ƒ and the sign of ƒ·. c) The Mean Value Theorem and its geometric interpretation-. d) Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa. Second derivatives a) Corresponding characteristics of the graphs of ƒ, ƒ·, and ƒ ·. b) Relationship between the concavity of ƒ and the sign of ƒ ·. c)Points of inflection as places where concavity changes. Applications of derivatives a) Analysis of curves, including the notions of monotonicity and concavity b) Optimization, both absolute (global) and relative (local) extrema c) Interpretation of the derivative as a rate of change in varied applied

		contexts, including velocity, speed, and acceleration

Unit Six: Modeling and Related Rates : Ch. 5.4-5.6 (17 Days)

Big Ideas: Modeling and Optimization, Linearization, Related Rates

Topics	Assessments	Standards
1. Modeling and Optimization a) Max and Min Problems (Extrema) 2. Linearization a) Linear approx. 3. Related Rates a) application problems	1. Homework is assigned for each section in Unit 5.4-5.6. Handout for each topic is given. 2. Design the best can project (Ecobrew) 3. 1-2 quizzes (Optimization and Related rates) are generally given to check understanding. 4. Unit 5.4-5.6 test (Free Response and MC)	Applications of derivatives a) Optimization, both absolute (global) and relative (local) extrema. b) Modeling rates of change, including related rates problems- c)Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.

Unit Seven: The Definite Integral: Ch. 6 (17 Days)

Big Ideas: Finite Sums, the Definite integral and anti-derivatives, Fundamental Theorem, Trap. Rule

Topics	Assessments	Standards
1. Estimating with finite sums a) LRAM, RRAM AND MRAM 2. Definite Integral and anti-derivatives a) Riemann sums b) Terminology and notation c) Area under the curve 1. above, below, constant, geometry d) Integrals on calculator e) Discontinuous intregrals 3. Fundamental Theorem of Calculus 4. Trapezoidal Rule	1. Homework is assigned for each section in Unit 6. Handout on Ram and definite integrals. 2. 1-2 quizzes (Ram and Integration) are generally given to check understanding. 4. Unit 6 test (Free Response and MC)	Integrals Interpretations and properties of definite integrals a) Definite integral as a limit of Riemann sums. Definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval:

		a) Basic properties of definite integrals (examples include additivity and linearity). Fundamental Theorem of Calculus a) Use of the Fundamental Theorem to evaluate definite integrals. b) Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined. Techniques of antidif ferentiation a) Antiderivatives following directly from derivatives of basic functions Numerical approximations to definite integrals. Use of Riemann sums (using left, right, and midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.

Unit Eight: Differential Equations and Mathematical Modeling : Ch. 7.1, 7.2 and 7.4 (15 days)
Big Ideas: Slope Fields, Initial Conditions, Integration by Substitution,

Topics	Assessments	Standards
1. Initial Conditions and anti-derivatives a) Indefinite integrals b) constant of integration c) rules for indef. integrals d)properties and application 2. Slope fields 3. Integration by substitution a) changing bounds for def. integrals b) separable diff. equations	1. Homework is assigned for each section in Unit 7.1, 7.2. Handout is given for slope fields, integration by substitution. 2. 1-2 quizzes (slope fields, subst.) are generally given to check understanding. 3. Unit 7 test (Free Response and MC)	Applications of antidif ferentiation a) Finding specific antiderivatives using initial conditions, including applications to motion along a line. b) Solving separable differential equations and using them in modeling (including the study of the equation y· = ky and exponential growth). Applications of integrals. Appropriate integrals are used in a variety of applications to model physical, biological, or economic situations.

(This unit has been omitted when time does not permit)

Unit Nine: Application of Definite Integrals : Ch. 8.1-8.3 (20 Days)

Big Ideas: Integral as Net Change, Areas in the plane, Volumes

Topics	Assessments	Standards
1. Integral as Net Change a)Linear motion b) Total distance traveled 2. Areas in the plane a) Area between two curves b) calculate intersecting points c) with respect to y d) using geometry 3. Volumes a) Known cross sections b) Disk and Washer method	1. Homework is assigned for each section in Unit 8.1-8.3. Handout is given for Area and volume 2. 1-2 quizzes (area and volume) are generally given to check understanding. 3. Unit 8 test (Free Response and MC)	Applications of integrals. Appropriate integrals are used in a variety of applications to model physical, biological, or economic situations. Although only a sampling of applications can be included in any specific course, students should be able to adapt their knowledge and techniques to solve other similar application problems. Whatever applications are chosen, the emphasis is on using the method of setting up an approximating Riemann sum and representing its limit as a definite integral. To provide a common foundation, specific applications should include finding the area of a region (including a region bounded by polar curves), the volume of a solid with known cross sections, the average value of a function, the distance traveled by a particle along a line, the length of a curve (including a curve given in parametric form), and accumulated change from a rate of change.
