AP Calculus

Overview

Course Description: Calculus is a college preparatory curriculum that continues covering many topics introduced in Pre-Calculus along with derivatives and integrals. This course is an Advance Placement Course. At the end of the course students should be able to take and pass the A.P. Exam.

Course Rationale: This is the final course offered in the Jonesville High School mathematics curriculum and prepares students for college-level mathematics.

Grades: 11-12

Prerequisites: Pre-Calculus

Other: 3 Trimesters

Units of Study

Unit Title	Length of Study
Review of Pre-Calc Topics	2 weeks
Limits and Continuity	4 weeks
Derivatives	15 weeks
Integrals	8 weeks
Test Preparation	4 weeks

Mathematics Core Units

Course Title: AP Calculus **Unit Title:** Limits and Continuity **Length of Unit** 20 days

Grade Level: 11 - 12 **Unit** 1 **of** 4

COMMON CORE STANDARDS COVERED	UNIT BENCHMARKS What do you want students to know, do, and be like?	KEY VOCABULARY	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
An intuitive understanding of the limiting process Calculating limits using algebra Estimating limits from graphs or tables of data Asymptotic and unbounded behavior Understanding asymptotes in terms of graphical behavior Describing asymptotic behavior in terms of limits involving infinity Comparing relative magnitudes of functions and their rates of change (for example, contrasting exponential growth, polynomial growth, and logarithmic growth) An intuitive understanding of continuity. (The function values can be made as close as desired by taking sufficiently close values of the domain) Understanding continuity in terms of limits Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem)	Same as standards covered	Limit Derivative Asymptotes Approaching Continuity Discontinuity Tangent Average Velocity Instantaneous Velocity Inflection Point Concavity Maximum Minimum Differentiable Antiderivative Acceleration Intermediate Value Theorem Extreme Value Theorem	1. Homework Assignments/AP Questions 2. Weekly Quizzes 3. Unit Test 4. Exit Tickets 5. 5-3-1 Reading Summary/Concept Check 6. "I Can…" Matrix 7. Comparison of student work vs exemplars 8. "I think I got it.." Self Assessment cards 9. Research and report on a real life application of limits	**TI-Nspire Calculators** • Geometry Pages **Web Resources** • Dynamic Exploration • Geogebra.org • Personal Website

Mathematics Core Units

Course Title: AP Calculus **Unit Title:** Derivatives **Length of Unit** 75 days

Grade Level: 11- 12 **Unit** 2 **of** 4

COMMON CORE STANDARDS COVERED	UNIT BENCHMARKS What do you want students to know, do, and be like?	KEY VOCABULARY	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
Derivative presented graphically, numerically, and analytically Derivative interpreted as an instantaneous rate of change Derivative defined as the limit of the difference quotient Relationship between differentiability and continuity 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 Tangent line to a curve at a point and local linear approximation Instantaneous rate of change as the limit of average rate of change Approximate rate of change from graphs and tables of values Corresponding characteristics of graphs of ƒ and ƒ' -Relationship between the increasing and decreasing behavior of ƒ and the sign of ƒ. The Mean Value Theorem and its geometric interpretation Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa Derivative interpreted as an instantaneous rate of change Corresponding characteristics of the graphs of ƒ, ƒ·, and ƒ'' Relationship between the concavity of ƒ and the sign of ƒ'' Points of inflection as places where concavity changes Analysis of curves, including the notions of monotonicity and concavity Optimization, both absolute (global) and relative (local) extrema	Same as standards covered	Derivative Power Rule Product Rule Quotient Rule Chain Rule Logarithmic Differentiation Implicit Differentiation U-Substitution Linear Approximation Related Rate First Derivative Test Second Derivative Test Mean Value Theorem Closed Interval Method Optimization Absolute Max/Min	1. Homework Assignments/AP Questions 2. Weekly Quizzes 3. Unit Test 4. Exit Tickets 5. 5-3-1 Reading Summary/Concept Check 6. "I Can…" Matrix 7. Comparison of student work vs exemplars 8. "I think I got it.." Self Assessment cards 9. Research and report on a real life application of derivatives	**TI-Nspire Calculators** • Geometry Pages **Web Resources** • Dynamic Exploration • Geogebra.org • Personal Website

Modeling rates of change, including related rates problems Use of implicit differentiation to find the derivative of an inverse function Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration Geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential equations Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions Derivative rules for sums, products, and quotients of functions Chain rule and implicit differentiation				

Mathematics Core Units

Course Title: AP Calculus **Unit Title:** Integrals **Length of Unit** 40 days

Grade Level: 11-12 **Page** 4 **of** 4

COMMON CORE STANDARDS COVERED	UNIT BENCHMARKS What do you want students to know, do, and be like?	KEY VOCABULARY	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
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 Basic properties of definite integrals (examples include additivity and linearity) Use of the Fundamental Theorem to evaluate definite integrals Use of the Fundamental Theorem to represent a particular antiderivative, and the analytical and graphical analysis of functions so defined Antiderivatives following directly from derivatives of basic functions Antiderivatives by substitution of variables (including change of limits for definite integrals) Finding specific antiderivatives using initial conditions, including applications to motion along a line Solving separable differential equations and using them in modeling (including the study of the equation y =ky and exponential growth) 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	Same as standards covered	Integral Integration Antiderivative Riemann Sum Midpoint Rule Indefinite Integral Definite Integral Fundamental Theorem of Calculus Substitution Rule Integration by Parts Washer Method Disk Method Solids of Revolution Shell Method Arc Length Average Value of a function Differential Equation Slope Field Separable Equations	1. Homework Assignments/AP Questions 2. Weekly Quizzes 3. Unit Test 4. Exit Tickets 5. 5-3-1 Reading Summary/Concept Check 6. "I Can…" Matrix 7. Comparison of student work vs exemplars 8. "I think I got it.." Self Assessment cards 9. Research and report on a real life application of derivatives	**TI-Nspire Calculators** • Geometry Pages **Web Resources** • Dynamic Exploration • Geogebra.org • Personal Website