Danville Area School District
Course Overview and Scope and Sequence

Course Title: Introduction to Calculus
Content Area: Mathematics
Grade Level: Grades 11 and 12
Date Developed: August 2023

COURSE OVERVIEW: This course is designed for the student that wants to take an honors level course without the academic rigor of the Advanced Placement Calculus AB course. Topics will include conic sections, limits, derivatives, application of derivatives, basic integrals and their application. If a student has received credit for AP Calculus AB, the student is not eligible to take this course. Prerequisites: Successful completion of Honors Trigonometry/Pre Calculus or Trigonometry and Pre-Calculus, or teacher recommendation.

ANCHOR STANDARDS:

- LIM-1.A Represent limits analytically using correct notation.
- LIM-1.B Interpret limits expressed in analytic notation.
- LIM-1.C Estimate limits of functions.
- LIM-1.D Determine the limits of functions using limit theorems.
- LIM-1.E Determine the limits of functions using equivalent expressions for the function or the squeeze theorem.
- LIM-2.A Justify conclusions about continuity at a point using the definition.
- LIM-2.B Determine intervals over which a function is continuous.
- LIM-2.C Determine values of x or solve for parameters that make discontinuous functions continuous, if possible.
- LIM-2.D Interpret the behavior of functions using limits involving infinity.
- LIM-3.A Interpret a limit as a definition of a derivative.
- LIM-4.A Determine limits of functions that result in indeterminate forms.
- LIM-5.A Approximate a definite integral using geometric and numerical methods.
- LIM-5.B Interpret the limiting case of the Riemann sum as a definite integral.
- LIM-5.C Represent the limiting case of the Riemann sum as a definite integral.

- FUN-1.A Explain the behavior of a function on an interval using the Intermediate Value Theorem.
- FUN-1.B Justify conclusions about functions by applying the Mean Value Theorem over an interval.
- FUN-1.C Justify conclusions about functions by applying the Extreme Value Theorem.
- FUN-2.A Explain the relationship between differentiability and continuity.
- FUN-3.A Calculate derivatives of familiar functions.
- FUN-3.B Calculate derivatives of products and quotients of differentiable functions.
- FUN-3.C Calculate derivatives of compositions of differentiable functions.
- FUN-3.D Calculate derivatives of implicitly defined functions.
- FUN-3.E Calculate derivatives of inverse and inverse trigonometric functions.
- FUN-3.F Determine higher order derivatives of a function.
- FUN-4.A Justify conclusions about the behavior of a function based on the behavior of its derivatives.
- FUN-4.B Calculate minimum and maximum values in applied contexts of analysis of functions.
- FUN-4.C Interpret minimum and maximum values calculated in applied contexts.
- FUN-4.D Determine critical points of implicit relations.
- FUN-4.E Justify conclusions about the behavior of an implicitly defined function based on evidence from its derivatives.
- FUN-5.A Represent accumulation functions using definite integrals.
- FUN-6.A Calculate a definite integral using areas and properties of definite integrals.
- FUN-6.B Evaluate definite integrals analytically using the Fundamental Theorem of Calculus.
- FUN-6.C Determine antiderivatives of functions and indefinite integrals, using knowledge of derivatives.
- FUN-6.D For integrands requiring substitution or rearrangements into equivalent forms:
    - (a) Determine indefinite integrals.
    - (b) Evaluate definite integrals.
- FUN-7.A Interpret verbal statements of problems as differential equations involving a derivative expression.
- FUN-7.B Verify solutions to differential equations.
- FUN-7.C Estimate solutions to differential equations.
- FUN-7.D Determine general solutions to differential equations.
- FUN-7.E Determine particular solutions to differential equations.
- FUN-7.F Interpret the meaning of a differential equation and its variables in context.
- FUN-7.G Determine general and particular solutions for problems involving differential equations in context.
- CHA-2.A Determine average rates of change using difference quotients.
- CHA-2.B Represent the derivative of a function as the limit of a difference quotient.
- CHA-2.C Determine the equation of a line tangent to a curve at a given point.
- CHA-2.D Estimate derivatives.
- CHA-3.A Interpret the meaning of a derivative in context.
- CHA-3.B Calculate rates of change in applied contexts.
- CHA-3.C Interpret rates of change in applied contexts.

- CHA-3.D Calculate related rates in applied contexts.
- CHA-3.E Interpret related rates in applied contexts.
- CHA-3.F Approximate a value on a curve using the equation of a tangent line.
- CHA-4.A Interpret the meaning of areas associated with the graph of a rate of change in context.
- CHA-4.B Determine the average value of a function using definite integrals.
- CHA-4.C Determine values for positions and rates of change using definite integrals in problems involving rectilinear motion.
- CHA-4.D Interpret the meaning of a definite integral in accumulation problems.
- CHA-4.E Determine net change using definite integrals in applied contexts.
- CHA-5.A Calculate areas in the plane using the definite integral.
- CHA-5.B Calculate volumes of solids with known cross sections using definite integrals.
- CHA-5.C Calculate volumes of solids of revolution using definite integrals.

KEY COURSE TEXT AND MATERIALS: Calculus for AP by Ron Larson and Paul Battaglia

KEY ASSESSMENTS:
Diagnostic: AP Precalculus Exam, PVAAS data
Formative: Concept quizzes, exit tickets, graded assignments
Summative: Unit tests, half-chapter quizzes, Final Exam

SCOPE AND SEQUENCE					
Unit	PRIORITY STANDARDS	SUPPORTING STANDARDS	ASSESSMENT	MATERIALS	TIMEFRAME
Preparation for Calculus	Review from Keystone Algebra I: A1.1.1.1, A1.1.1.3, A1.1.1.5, A1.1.2.1, A1.2.2.1 Review from Keystone Algebra II: A2.1.2.1, A2.1.2.2,	A1.1.1.1.2, A1.1.1.3.1, A1.1.1.5.1, A1.1.5.2, A1.1.1.5.3, A1.1.2.1.1, A1.1.2.1.3, A1.2.2.1.1, A1.2.2.1.2, A1.2.2.1.3, A1.2.2.1.4, A2.1.1.1.1, A2.1.1.1.2, A2.1.2.1.1, A2.1.2.1.2, A2.1.2.1.3, A2.1.2.1.4, A2.1.2.2.1,	Unit review exam	Textbook assignments, teacher created materials. All materials will be posted on Google Classroom.	9-10 days

	A2.1.3.1, A2.1.3.2, A2.2.1.1, A2.2.2.1	A2.1.2.2.2, A2.1.3.1.1, A2.1.3.1.2, A2.1.3.1.3, A2.1.3.1.4, A2.1.3.2.2, A2.2.1.1.3, A2.2.1.1.4, A2.2.2.1.1, A2.2.2.1.2, A2.2.2.1.3, A2.2.2.1.4			
Limits and Continuity	LIM-1.A, LIM-1.B, LIM-1.C, LIM-1.D, LIM-1.E, LIM-2.A, LIM-2.B, LIM-2.C, LIM-2.D	LIM-2.A.1, LIM-2.A.2, LIM-2.B.1, LIM-2.B.2, LIM-2.C.1, LIM-2.C.2, LIM-2.D.1, LIM-2.D.2, LIM-2.D.3, LIM-2.D.4, LIM-2.D.5.	Unit quiz, multiple choice graded assignment, free response graded assignment	Textbook assignments, teacher created materials. All materials will be posted on Google Classroom.	12-13 days
Evaluating Derivatives, Part 1	CHA-2.A, CHA-2.B, CHA-2.C, CHA-2.D, CHA-3.B, CHA-3.C FUN-2.A, FUN-3.A, FUN-3.B, FUN-3.F LIM-3.A	CHA-2.A.1, CHA-2.B.1, CHA-2.B.2, CHA-2.B.2, CHA-2.B.3, CHA-2.B.4, CHA-2.C.1, CHA-2.D.1, CHA-2.D.2, FUN-2.A.1, FUN-2.A.2, FUN-3.A.1, FUN-3.A.2, FUN-3.A.3, FUN-3.A.4, FUN-3.B.1, FUN-3.B.2, FUN-3.B.3, FUN-3.B.1, FUN-3.B.2, FUN-3.B.3, FUN-3.F.1, FUN-3.F.2, LIM-3.A.1	Unit exam, quiz, multiple choice graded assignment, free response graded assignment	Textbook assignments, teacher created materials. All materials will be posted on Google Classroom.	17-18 days
Evaluating Derivatives, Part 2	FUN-3.A, FUN-3.B, FUN-3.C, FUN-3.D, FUN-3.E, FUN-3.F	FUN-3.A.1, FUN-3.A.2, FUN-3.A.3, FUN-3.A.4, FUN-3.B.1, FUN-3.B.2, FUN-3.B.3 FUN-3.C.1,	Unit exam, graded free response assignment, AP Classroom assignment	Textbook assignments, teacher created materials. All materials will be posted on Google	17-18 days

		FUN-3.D.1, FUN-3.E.1, FUN-3.F.1, FUN-3.F.2		Classroom.	
Applications of Derivatives, Part 1	CHA-3.D, CHA-3.E, CHA-3.F, FUN-1.B, FUN-1.C, FUN-4.A, FUN-4.B, FUN-4.C	CHA-3.D.1, CHA-3.D.2, CHA-3.E.1, CHA-3.F.1, CHA-3.F.2, FUN-1.B.1, FUN-1.C.1, FUN-4.A.1, FUN-4.A.2, FUN-4.A.3, FUN-4.A.4, FUN-4.A.5, FUN-4.A.6, FUN-4.B.1, FUN-4.C.1	Unit exam, quiz, multiple choice graded assignment, free response graded assignment	Textbook assignments, teacher created materials. All materials will be posted on Google Classroom.	15-16 days
Applications of Derivatives, Part 2	CHA-3.D, CHA-3.E, CHA-3.F, FUN-1.B, FUN-1.C, FUN-4.A, FUN-4.B, FUN-4.C	CHA-3.D.1, CHA-3.D.2, CHA-3.E.1, CHA-3.F.1, CHA-3.F.2, FUN-1.B.1, FUN-1.C.1, FUN-4.A.1, FUN-4.A.2, FUN-4.A.3, FUN-4.A.4, FUN-4.A.5, FUN-4.A.6, FUN-4.B.1, FUN-4.C.1	Unit exam, quiz, multiple choice graded assignment, free response graded assignment	Textbook assignments, teacher created materials. All materials will be posted on Google Classroom	19-20 days
Integration	FUN-6.A, FUN-6.B, FUN-6.C, FUN-7.B, LIM-5.A, LIM-5.B	FUN-6.A.1, FUN-6.A.2, FUN-6.A.3, FUN-6.B.1, FUN-6.B.2, FUN-6.B.3, FUN-6.C.1, FUN-6.C.2, FUN-6.C.3, FUN-7.B.1, FUN-7.B.2, LIM-5.A.1, LIM-5.A.2, LIM-5.A.3, LIM-5.A.4, LIM-5.B.1, LIM-5.B.2	Unit exam, quizzes, multiple choice graded assignments, free response graded assignments	Textbook assignments, teacher created materials. All materials will be posted on Google Classroom	30-31 days
Applications of Integration	CHA-5.A, CHA-5.B, CHA-5.C, FUN-7.A,	CHA-5.A.1, CHA-5.A.2, CHA-5.A.3, CHA-5.B.1,	Unit exam, quizzes, multiple	Textbook assignments,	24-25 days

	FUN-7.B, FUN-7.C, FUN-7.D, FUN-7.E, FUN-7.F, FUN-7.G, LIM-4.A	CHA-5.B.2, CHA-5.B.3, CHA-5.C.1, CHA-5.C.2, FUN-7.A.1, FUN-7.B.1, FUN-7.B.2, FUN-7.C.1, FUN-7.C.2, FUN-7.C.3, FUN-7.D.1, FUN-7.D.2 FUN-7.E.1, FUN-7.E.2, FUN-7.E.3, FUN-7.F.1, FUN-7.F.2, FUN-7.G, LIM-4.A.1, LIM-4.A.2	choice graded assignments, free response graded assignments	teacher created materials. All materials will be posted on Google Classroom	
Final Exam Review	All standards listed in the Anchors/Standards are reviewed here.	All standards listed in the Anchors/Standards are reviewed here	Released exam (2013), Final Exam (secure exam from Course Audit), Free Response questions from past years	The College Board created materials via secure documents through the Course Audit and AP Classroom.	13-24 days (pending start of the school year and date of the AP Exam)