Course Name
Program of Studies Description

*40452H ADVANCED PLACEMENT CALCULUS BC

(Grade 12) (1.0 Credit)

(Prerequisite: Successful completion of Calculus AP, Level AB and teacher recommendation)

This course is intended for students with an exceptional knowledge of analytic geometry, elementary functions, algebra, geometry and trigonometry. This course is geared toward the advanced mathematics student who will encounter higher mathematics in college in specialized fields such as engineering, science and/or mathematics. Topics to be studied include differentiation and applications, integration and applications, transcendental functions, methods of integration, polar coordinates, vectors and equations, infinite series and differential equations. This course requires frequent use of graphing calculators. It is strongly recommended that students have their own graphing calculator. Completion of this course will prepare the student for the Advanced Placement Calculus BC test in May. **Students will have the opportunity to register to take the AP Exam in May.**

Advanced Placement Calculus BC

Syllabus

Whitehall-Coplay School District Syllabus

Course Title: Advanced Placement Calculus BC **Grade: 10-12**

DESCRIPTION OF COURSE:

This course is intended for students with an exceptional knowledge of analytic geometry, elementary functions, algebra, geometry, and trigonometry. This course is geared towards the advanced mathematics student who will encounter higher mathematics in college in specialized fields such as engineering, science and/or mathematics. Topics to be studied include differentiation and applications, integration and applications, transcendental functions, methods of integration, polar coordinates, vectors and equations, infinite series and differential equations. This course requires frequent use of a graphing calculator. It is strongly recommended that students have their own graphing calculator. Completion of this course will prepare students for the Advanced Placement Calculus BC exam in May. This course has a summer assignment that is required. **In order to receive AP weight for this course, students must take the AP exam in May.** ** Eligible content taken from mathematical practices from College Board AP Calculus **

REQUIRED TOPICS OF STUDY	SUGGESTED INSTRUCTIONAL TIME	STANDARDS/ELIGIBLE CONTENT
Review Units 1, 2, 3, 4, and 5 AB Calculus Curriculum	10 class periods	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11, 5.12
Unit 6: Integration and Accumulation of Change	10 class periods	6.8, 6.9, 6.10, 6.11, 6.12, 6.13, 6.14
Unit 7: Differential Equations	10 class periods	7.5, 7.6, 7.7, 7.8, 7.9
Unit 8: Applications of Integration	10 class periods	8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 8.12
Unit 9: Parametric Equations, Polar Coordinates and Vector Valued Functions	15 class periods	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9
Unit 10: Infinite Sequences and Series	25 class periods	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10, 10.11, 10.12, 10.13, 10.14, 10.15

RESOURCES: Calculus: Graphical, Numerical, Algebraic(3rd Edition), Pearson Prentice Hall, 2007

TI-84 Plus or TI-84 CE(color edition.)

June 2026

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Curriculum Map

Unit 0	**Review of AB Material**	
Big Idea	**Students will recall their knowledge on the Fundamental Theorem of Calculus**	
Unit Essential Questions:	**Using derivatives to describe rates of change of one variable with respect to another or using definite integrals to describe the net change in one variable over an interval of another allows students to understand change in a variety of contexts. It is critical that students grasp the relationship between integration and differentiation as expressed in the Fundamental Theorem of Calculus - a central idea of Calculus**	
Total Number of Days for Unit	**3**	

Date/weeks	PA Standards/ Eligible Content	Vocabulary	Instructional Materials	Common Assessments	Link to Profile of a Zephyr	Resources
	Applying properties of definite integrals The Fundamental Theorem of Calculus and definite Integrals Finding antiderivatives and indefinite integrals, basic rules and notation Integrating using Substitution		Notes Worksheets, AP Classroom Delta Math IXL TI Graphing Calculator	Quizzes and Tests		

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Unit 7	**Differential Equations**
Big Idea	**Students revisit how to set up and solve separable differential equations. Slope fields can be used to represent solutions to curves to a differential equation and build understanding that there are infinitely many general solutions to a differential equation, varying only by a constant of integration.**
Unit Essential Questions:	**Calculus allows us to analyze the behaviors of functions by relating limits to differentiation, integration and relating each of these concepts to the others**
Total Number of Days for Unit	**6**

Dates/weeks	PA Standards/ Eligible Content	Vocabulary	Instructional Materials	Common Assessments	Link to Profile of a Zephyr
	Modelling Situations with differential equations Verifying solutions for differential equations Sketching slope fields Reasoning using slope fields Finding general solutions using separation of variables Finding particular solutions using initial conditions and separation of variables		Notes Worksheets, AP Classroom Delta Math IXL TI Graphing Calculator	Quizzes and Tests	

	Exponential models with differential equations BC Only - Logistic Models with differential equations BC Only - Approximating solutions using Euler's method				

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Unit 7	**Applications of Integration**
Big Idea	**Students will learn how to find the average value of a function, model particle motion and net change, and determine areas and volumes.**
Unit Essential Questions:	**Using derivatives to describe rates of change of one variable with respect to another or using definite integrals to describe the net change in one variable over an interval of another allows students to understand change in a variety of contexts. It is critical that students grasp the relationship between integration and differentiation as expressed in the Fundamental Theorem of Calculus - a central idea of Calculus**
Total Number of Days for Unit	**6**

Dates/weeks	PA Standards/ Eligible Content	Vocabulary	Instructional Materials	Common Assessments	Link to Profile of a Zephyr
	Finding the average value of a function on an interval Connecting position, velocity and acceleration of functions using integration Using accumulation function and definite integrals in applied contexts Finding the area between curves expressed as functions of x Finding the area between curves expressed as functions of y		Notes Worksheets, AP Classroom Delta Math IXL TI Graphing Calculator	Quizzes and Tests	

	Finding the area between curves that intersect in more than two points Volumes with cross sections, squares and rectangles Volume with cross sections triangles and semicircles Volumes with disc method; revolving around the x or y-axis Volume with disc method; revolving around other axes Volume with washer method; revolving around the x or y-axis Volume with washer method; revolving around other axes The arc length of a smooth, planar curve and distance traveled				

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Unit 6	**Integration and Accumulation of Change**					
Big Idea	**Students will learn different integration techniques**					
Unit Essential Questions:	**Using derivatives to describe rates of change of one variable with respect to another or using definite integrals to describe the net change in one variable over an interval of another allows students to understand change in a variety of contexts. It is critical that students grasp the relationship between integration and differentiation as expressed in the Fundamental Theorem of Calculus - a central idea of Calculus**					
Total Number of Days for Unit	**8**					
Date/weeks	**PA Standards/ Eligible Content**	**Vocabulary**	**Instructional Materials**	**Common Assessments**	**Link to Profile of a Zephyr**	**Resources**
	Using Integration by Parts Integration using linear partial fractions Evaluation Improper Integrals		Notes Worksheets, AP Classroom Delta Math IXL TI Graphing Calculator	Quizzes and Tests		

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Unit 9	**Parametric Equations, Polar Coordinates and Vector-Valued Functions**	
Big Idea	**Students will build on their understanding of straight-line motion to solve problems in which particles are moving along curves in the plane.**	
Unit Essential Questions:	**Using derivatives to describe rates of change of one variable with respect to another or using definite integrals to describe the net change in one variable over an interval of another allows students to understand change in a variety of contexts. It is critical that students grasp the relationship between integration and differentiation as expressed in the Fundamental Theorem of Calculus - a central idea of Calculus** **Calculus allows us to analyze the behaviors of functions by relating limits to differentiation, integration and relating each of these concepts to the others**	
Total Number of Days for Unit	**15**	

Date/weeks	PA Standards/ Eligible Content	Vocabulary	Instructional Materials	Common Assessments	Link to Profile of a Zephyr	Resources
	Defining and differentiating parametric equations Second derivatives of parametric equations Finding arc length of curves given by parametric equations Defining and differentiating vector-valued functions		Notes Worksheets, AP Classroom Delta Math IXL TI Graphing Calculator	Quizzes and Tests		

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	Integration vector-valued functions Solving motion problems using parametric and vector-valued functions Defining polar coordinates and differentiating in polar form Find the area of a polar region of the area bounded by a single polar curve Finding the area of the region bounded by two polar curves					

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Unit 10	**Infinite Sequences and Series**	
Big Idea	**Students need to understand that a sum of infinitely many terms may converge to a finite value. They can develop intuition by exploring graphs, tables and symbolic expressions for series that converge and diverge and for Taylor polynomials.**	
Unit Essential Questions:	**Beginning with a discrete model and then considering the consequences of a limiting case allows us to model real-world behavior and to discover and understand important ideas, definitions, formulas, and theorems in calculus for example, continuity, differentiation, integration.**	
Total Number of Days for Unit	**15-20**	

Date/weeks	PA Standards/ Eligible Content	Vocabulary	Instructional Materials	Common Assessments	Link to Profile of a Zephyr	Resources
	Defining Convergent and Divergent Infinite Series Working with Geometric Series The nth-Term Test for Divergence Integral Test for convergence Harmonic series and p-series Comparison tests for		Notes Worksheets, AP Classroom Delta Math IXL TI Graphing Calculator	Quizzes and Tests		

	convergence Alternating series test for convergence Ratio test for convergence Determining absolute or conditional convergence Alternating series error bound Finding Taylor polynomial approximations of functions Lagrange error bound Radius and interval of convergence of power series Finding Taylor or Maclaurin series for a function Representing functions as power series					