**COURSE DESCRIPTION**

**Course Title:** Calculus BC

**Course Number:** 00293

**Course Prerequisites:** AP Calculus AB with an average of 60% or above.

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| **Course Description:** | AP Calculus BC is intended for accelerated students who have a thorough knowledge of the complete academic with honors sequence. It is designed to develop and reinforce the fundamental functional behavior of the following topics: differentiation, integration, infinite series, three-dimensional space, vectors, conic sections, polar coordinates, and parametric equations. |

**Suggested Grade Level**: Grade 12

**Length of Course:** Two Semesters

**Units of Credit:** 1

**PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:**

CSPG #50 Mathematics

To find the CSPG information, go to [CSPG](https://www.education.pa.gov/Educators/Certification/Staffing%20Guidelines/Pages/default.aspx)

**Certification verified by the WCSD Human Resources Department:** Yes No

**WCSD STUDENT DATA SYSTEM INFORMATION**

**Course Level:** AP & Dual Enrollment (.33) GPA +3%

**Mark Types:** Check all that apply.

F – Final Average MP – Marking Period EXM – Final Exam

**GPA Type**:  GPAEL-GPA Elementary  GPAML-GPA for Middle Level  NHS-National Honor Society

UGPA-Non-Weighted Grade Point Average  GPA-Weighted Grade Point Average

**State Course Code**: 02125

To find the State Course Code, go to [State Course Code](https://nces.ed.gov/forum/sced.asp), download the Excel file for *SCED*, click on SCED 6.0 tab, and chose the correct code that corresponds with the course.

**TEXTBOOKS AND SUPPLEMENTAL MATERIALS**

**Board Approved Textbooks, Software, and Materials:**

**Title:**  Calculus AP

**Publisher:** Cengage Learning (Larson/Battaglia)

**ISBN #:**  9781337286886

**Copyright Date:** 2018

**WCSD Board Approval Date:** 6/29/2020

**Supplemental Materials:** Click or tap here to enter text.

**Curriculum Document**

**WCSD Board Approval:**

**Date Finalized:** 6/5/2020

**Date Approved:**  6/29/2020

**Implementation Year:** 2020-2021

**SPECIAL EDUCATION, 504, and GIFTED REQUIREMENTS**

The teacher shall make appropriate modifications to instruction and assessment based on a student’s Individual Education Plan (IEP), Chapter 15 Section 504 Plan (504), and/or Gifted Individual Education Plan (GIEP).

**SCOPE AND SEQUENCE OF CONTENT, CONCEPTS, AND SKILLS**

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| **Performance Indicator** | **PA Core Standard and/or Eligible Content** | **Month Taught and Assessed for Mastery** |
| Find limits graphically, algebraically, and using tables. | Click or tap here to enter text. | September  October |
| Find limits at infinity and infinite limits. | Click or tap here to enter text. | September  October |
| Use the Squeeze Theorem. | Click or tap here to enter text. | September  October |
| Identify x-values for which a function is not continuous; determine removable and non-removable discontinuities. | Click or tap here to enter text. | September  October |
| Identify horizontal and vertical asymptotes of graphs. | Click or tap here to enter text. | September  October |
| Graphically estimate the slope of a curve at a given point. | Click or tap here to enter text. | September  October |
| Determine the differentiability of a function. | Click or tap here to enter text. | September  October |
| Find the derivative of a function using the definition of derivative, basic derivative rules, product rule, quotient rule, and chain rule. | Click or tap here to enter text. | September  October |
| Find the equation of a line tangent to a curve at a given point. | Click or tap here to enter text. | September  October |
| Find the derivative using implicit differentiation. | Click or tap here to enter text. | September  October |
| Find derivatives of trigonometric functions. | Click or tap here to enter text. | September  October |
| Find higher-order derivatives. | Click or tap here to enter text. | September  October |
| Complete application problems involving velocity and rates of change. | Click or tap here to enter text. | September  October |
| Solve related-rate word problems. | Click or tap here to enter text. | September  October |
| Identify absolute and relative extrema of a function and determine the value of the derivative at indicated extrema. | Click or tap here to enter text. | September  October |
| Identify intervals on which a function is increasing/decreasing and concave up/down. | Click or tap here to enter text. | September  October |
| Find the critical numbers of a function. | Click or tap here to enter text. | September  October |
| Determine whether Rolle’s Theorem can be applied to a function on an indicated interval. If Rolle’s Theorem can be applied, find all values of c in the interval such that f(c) = 0. | Click or tap here to enter text. | September  October |
| Apply the Mean Value Theorem to a function on an indicated interval and explain why the Mean Value Theorem does not apply to certain functions. | Click or tap here to enter text. | September  October |
| Apply the First and Second Derivative tests to identify relative extrema. | Click or tap here to enter text. | September  October |
| Identify points of inflection for a function. | Click or tap here to enter text. | September  October |
| Sketch the graph of an equation using extrema, intercepts, symmetry, asymptotes, concavity, points of inflection and intervals of increasing and decreasing. | Click or tap here to enter text. | September  October |
| Complete optimization problems involving area, volume, and business applications. | Click or tap here to enter text. | September  October |
| Find sums given Sigma notation and use Sigma notation to write sums given by an expression. | Click or tap here to enter text. | September  October |
| Set up and evaluate indefinite integrals. | Click or tap here to enter text. | September  October |
| Use upper and lower sums to approximate the area of a region using the indicated number of subintervals. | Click or tap here to enter text. | September  October |
| Set up and evaluate definite integrals of algebraic and trigonometric functions using the limit process, geometrically as an accumulation process and, using the Fundamental Theorem of Calculus. | Click or tap here to enter text. | September  October |
| Apply the Mean Value Theorem for Integrals for a function over a given interval. | Click or tap here to enter text. | September  October |
| Integrate to find a function F(x) and demonstrate the Second Fundamental Theorem of Calculus by differentiating the result. | Click or tap here to enter text. | September  October |
| Evaluate definite and indefinite integrals using substitution. | Click or tap here to enter text. | September  October |
| Use the Trapezoidal Rule and Simpson’s Rule to approximate the value of a definite integral for an indicated value of n. | Click or tap here to enter text. | September  October |
| Find the first and higher-order derivatives of exponential functions, logarithmic functions (base *e* and other bases), and inverse trigonometric functions. | Click or tap here to enter text. | October  November |
| Find indefinite integrals and evaluate definite integrals involving exponential functions, logarithmic functions (base *e* and other bases), and inverse trigonometric functions. | Click or tap here to enter text. | October  November |
| Interpret the relationship between slope fields with the solution curves of differential equations and use slope fields to approximate solutions to differential equations. | Click or tap here to enter text. | October  November |
| Find the general solution of a differential equation and use initial conditions to find particular solutions of differential equations. | Click or tap here to enter text. | October  November |
| Solve differential equations using separation of variables. | Click or tap here to enter text. | October  November |
| Use Euler’s Method to approximate solutions of differential equations. | Click or tap here to enter text. | October  November |
| Use exponential functions and differential equations to model and solve applied problems. | Click or tap here to enter text. | October  November |
| Solve and analyze logistic differential equations. | Click or tap here to enter text. | October  November |
| Find the area of a region bounded by two or more curves. | Click or tap here to enter text. | November  December |
| Find the volume of a solid formed by revolving a region about the x-axis, y-axis, and lines other than the axes. | Click or tap here to enter text. | November  December |
| Find the arc length of a smooth curve. | Click or tap here to enter text. | November  December |

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| Find the area of a surface of revolution. | Click or tap here to enter text. | November  December |
| Find integrals using integration by parts. | Click or tap here to enter text. | December  January |
| Solve trigonometric integrals involving powers of sine and cosine, powers of secant and tangent, trigonometric substitution, and products of sine and cosine. | Click or tap here to enter text. | December  January |
| Use partial fraction decomposition with linear and quadratic factors to integrate rational functions. | Click or tap here to enter text. | December  January |
| Evaluate an indefinite integral using a table of integrals. | Click or tap here to enter text. | December  January |
| Evaluate an improper integral has an infinite limit of integration and improper integrals that have an infinite discontinuity. | Click or tap here to enter text. | December  January |
| Apply L’Hopital’s Rule to evaluate a limit. | Click or tap here to enter text. | December  January |
| Determine whether a series converges or diverges using the nth-Term Test fir Divergence, the Integral Test, the Direct Comparison Test, the Alternating Series Test, the Ratio Test, the Limit Comparison test, and the Root Test. | Click or tap here to enter text. | January  February |
| Classify a convergent series as absolutely or conditionally convergent. | Click or tap here to enter text. | January  February |
| Understand the definition of a Power Series. | Click or tap here to enter text. | January  February |
| Find a geometric power series that represents a function. | Click or tap here to enter text. | January  February |
| Find a Taylor and Maclaurin series for a function. | Click or tap here to enter text. | January  February |
| Use properties of p-series and harmonic series. | Click or tap here to enter text. | January  February |
| Find Taylor and Maclaurin polynomial approximations of elementary functions. | Click or tap here to enter text. | January  February |
| Find the radius and interval of convergence of a power series. | Click or tap here to enter text. | January  February |
| Determine endpoint convergence of a power series. | Click or tap here to enter text. | January  February |
| Differentiate and integrate a power series. | Click or tap here to enter text. | January  February |
| Sketch the graph of a curve and find the slope of a tangent line to a curve given a set of parametric equations and in polar form. | Click or tap here to enter text. | March  April |
| Eliminate the parameter in a set of parametric equations. | Click or tap here to enter text. | March  April |
| Find a set of parametric equations to represent a curve. | Click or tap here to enter text. | March  April |
| Find the arc length of a curve given by a set of parametric equations and in polar form. | Click or tap here to enter text. | March  April |
| Calculate the area of a surface of revolution in parametric form and in polar form. | Click or tap here to enter text. | March  April |
| Rewrite rectangular coordinates and equations in polar form. | Click or tap here to enter text. | March  April |
| Find the points of intersection of two polar graphs. | Click or tap here to enter text. | March  April |
| Calculate the area of a region bounded by a polar graph. | Click or tap here to enter text. | March  April |
| Write a vector in component form and as a linear combination. | Click or tap here to enter text. | April  May |
| Understand the 3-D rectangular coordinate system. | Click or tap here to enter text. | April  May |
| Use properties of the dot product of two vectors and use the dot product to find the angle between two vectors. | Click or tap here to enter text. | April  May |
| Perform vector operations including the cross product and interpret the results graphically. | Click or tap here to enter text. | April  May |
| Use vectors to solve problems involving force and velocity. | Click or tap here to enter text. | April  May |
| Analyze vectors in space. | Click or tap here to enter text. | April  May |
| Use 3-D vectors to solve real world problems. | Click or tap here to enter text. | April  May |
| Find the direction cosines of a vector in space. | Click or tap here to enter text. | April  May |
| Analyze and sketch a space curve given by a vector-valued function. | Click or tap here to enter text. | April  May |
| Extend the concepts of limits, continuity, differentiation, and integration to vector-valued functions. | Click or tap here to enter text. | April  May |
| Describe the velocity and acceleration associated with a vector-valued function. | Click or tap here to enter text. | April  May |
| Use vector-valued functions to analyze projectile motion. | Click or tap here to enter text. | April  May |

**ASSESSMENTS**

**PSSA Academic Standards, Assessment Anchors, and Eligible Content:** The teacher must be knowledgeable of the PDE Academic Standards, Assessment Anchors, and Eligible Content and incorporate them regularly into planned instruction.

**Formative Assessments:** The teacher will utilize a variety of assessment methods to conduct in-process evaluations of student learning.

**Effective formative assessments for this course include:** Suggested but not limited to: Bell Ringers, Exit Tickets, Cooperative Learning, Observations, Written Work, Quizzes, Oral Response, Self-Evaluation, and Homework

**Summative Assessments:** The teacher will utilize a variety of assessment methods to evaluate student learning at the end of an instructional task, lesson, and/or unit.

**Effective summative assessments for this course include:**  Suggested but not limited to: Performance Assessment, Chapter/Unit Tests, and Projects