**COURSE DESCRIPTION**

**Course Title:** Honors Pre-Calculus

**Course Number:** 00271

**Course Prerequisites:** Recommended grade average of 80% of higher in Honors Algebra II and Honors Geometry.

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| **Course Description:** | Pre-Calculus Honors is an academic course designed primarily for students who plan to enter college and pursue a program of studies in mathematics or a mathematically related field such as engineering, accounting, or pre-medicine. We will study functions and graphs (linear, quadratic, polynomial, rational, exponential, logarithmic, and trigonometric), analytic trigonometry, and analytic geometry. It is strongly recommended that students planning to enroll in Calculus are first exposed to the rigors of Pre-Calculus. After successful completion of this course, it is recommended that students take Calculus or Advanced Placement Calculus. |

**Suggested Grade Level**: Grades 11-12

**Length of Course:** Two Semesters

**Units of Credit:** 1

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

Mathematics #50

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:** Honors & Dual Enrollment (1) GPA +5%

**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**: 02110

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:**  Pre-Calculus with Limits: A Graphing Approach

**ISBN #:**  978-1-337-90428-5

**Copyright Date:** 2020

**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** |
| Apply basic rules and properties of Algebra. | 2.1, 2.2 | August  September |
| Apply properties of exponents and radicals. | 2.1, 2.2 | August  September |
| Factor polynomials. | 2.1, 2.2 | August  September |
| Simplify Rational Expressions and Functions. | 2.1, 2.2 | August  September |
| Solve linear equations. | 2.2 | August  September |
| Solve multi-step linear inequalities. | 2.2 | August  September |
| Solve quadratic equations | 2.2 | August  September |
| Find the slopes of lines. | 2.2 | September  October |
| Write linear equations given points on lines and their slopes. | 2.2 | September  October |
| Use slope intercept form of linear functions to sketch lines. | 2.2 | September  October |
| Use slopes to identify parallel and perpendicular lines. | 2.2 | September  October |
| Determine if a relation between two variables represents a function. | 2.2 | September  October |
| Use function notation and evaluate functions. | 2.2 | September  October |
| Find the domain of functions. | 2.2 | September  October |
| Use functions to model and solve real like problems. | 2.2 | September  October |
| Evaluate difference quotients. | 2.2 | September  October |
| Find the domain and range of functions and use the vertical line test for functions. | 2.2 | September  October |
| Determine intervals on which functions are increasing, decreasing, or constant. | 2.2 | September  October |
| Determine relative minimums and relative maximums of functions. | 2.2 | September  October |
| Identify and graph step functions and other piece-wise defined functions. | 2.2 | September  October |
| Identify even and odd functions. | 2.2 | September  October |
| Recognize graphs of parent functions. | 2.2 | September  October |
| Use vertical and horizontal shifts to sketch graphs of functions. | 2.2 | September  October |
| Use reflections to sketch graphs of functions. | 2.2 | September  October |

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| Use non-rigid transformations to sketch graphs of functions. | 2.2 | September  October |
| Add, subtract, multiply, and divide functions. | 2.2 | September  October |
| Find compositions of one function with another function. | 2.2 | September  October |
| Use combinations of functions to model and solve real life problems. | 2.2 | September  October |
| Find inverse functions informally and verify that two functions are inverse functions of each other. | 2.2 | September  October |
| Use graphs of functions to determine if functions have inverse functions. | 2.2 | September  October |
| Determine if functions are one to one. | 2.2 | September  October |
| Find inverse functions algebraically. | 2.2 | September  October |
| Construct scatterplots and interpret correlation. | 2.2 | September  October |
| Use scatterplots in a graphing utility to find linear models for data. | 2.2 | September  October |
| Analyze graphs of quadratics functions. | 2.2 | October  November |
| Write quadratic functions in standard form and use the results to sketch graphs of functions. | 2.2 | October  November |
| Find minimum and maximum values of quadratics functions in real life situations. | 2.2 | October  November |
| Use transformations to sketch graphs of polynomial functions. | 2.2 | October  November |
| Use the leading coefficient test to graph the end behavior of polynomial functions. | 2.2 | October  November |
| Find and use zeros of polynomial functions as sketching aides. | 2.2 | October  November |
| Use the intermediate value theorem to help locate zeros of polynomial functions. | 2.2 | October  November |
| Use long division to divide polynomials by other polynomials. | 2.2 | October  November |
| Use synthetic division to divide polynomials by binomials. | 2.2 | October  November |
| Use the remainder and factor theorems. | 2.2 | October  November |
| Use the rational zero test to determine possible rational zeros of polynomials functions | 2.2 | October  November |
| Use Descartes’ Rules of signs and the upper and lower bounds to find real zeros of polynomials. | 2.2 | October  November |
| Use the imaginary unit i to write complex numbers. | 2.2 | October  November |
| Add, subtract, multiply, and divide complex numbers. | 2.2 | October  November |
| Use complex conjugates to write the quotient of two complex numbers in standard form. | 2.2 | October  November |
| Find complex solutions of quadratic equations. | 2.2 | October  November |
| Use the fundamental theorem of algebra to determine the number of zeros of a polynomial function. | 2.2 | October  November |
| Find all zeros of polynomial functions. | 2.2 | October  November |
| Find conjugate pairs of complex zeros. | 2.2 | October  November |
| Find zeros of polynomials by factoring. | 2.2 | October  November |
| Find the domains of rational functions. | 2.2 | October  November |
| Find vertical and horizontal asymptotes of rational functions. | 2.2 | October  November |
| Use rational functions to model and solve real life problems. | 2.2 | October  November |
| Analyze and sketch graphs of rational functions. | 2.2 | October  November |
| Sketch graphs of rational functions that have slant asymptotes. | 2.2 | October  November |
| Use graphs of rational functions to model and solve real life problems. | 2.2 | October  November |
| Classify scatter plots. | 2.2 | October  November |
| Use scatter plots and a graphing utility to find quadratic models for data. | 2.2 | October  November |
| Choose a model that best fits a set of data. | 2.2 | October  November |
| Recognize and evaluate exponential functions with base a. | 2.2 | December  January |
| Graph exponential functions with base a. | 2.2 | December  January |
| Recognize and evaluate and graph exponential functions with base e. | 2.2 | December  January |
| Use exponential functions to model and solve real life problems. | 2.2 | December  January |
| Recognize and evaluate logarithmic functions with base a. | 2.2 | December  January |
| Graph logarithmic functions with base a. | 2.2 | December  January |
| Recognize, evaluate, and graph natural logarithmic functions. | 2.2 | December  January |
| Use logarithmic functions to model and sole real life problems. | 2.2 | December  January |
| Rewrite logarithms with different bases. | 2.2 | December  January |
| Use properties of logarithms to evaluate or rewrite logarithmic expressions. | 2.2 | December  January |
| Use properties of logarithms to expand or condense logarithmic expressions. | 2.2 | December  January |
| Use logarithmic functions to model and solve real life problems. | 2.2 | December  January |
| Solve simple exponential and logarithmic equations. | 2.2 | December  January |
| Solve more complicated exponential equations. | 2.2 | December  January |
| Solve more complicated logarithmic equations. | 2.2 | December  January |
| Use exponential and logarithmic equations to model and solve real life problems. | 2.2 | December  January |
| Recognize the five most common types of models involving exponential or logarithmic functions. | 2.2 | December  January |
| Use exponential growth and decay functions to model and solve real life problems. | 2.2 | December  January |
| Use Gaussian functions to solve and model real life problems. | 2.2 | December  January |
| Use logistic growth functions to model and solve real life problems. | 2.2 | December  January |
| Use logarithmic functions to model and solve real life problems. | 2.2 | December  January |
| Classify scatterplots. | 2.2 | December  January |
| Use scatterplots and a graph utility to find models for data and determine the model that best fits a set of data. | 2.2 | December  January |
| Use a graphing utility to find exponential and logistic models for data. | 2.2 | December  January |
| Describe angles. | 2.3 | January  February |
| Use radian measure. | 2.2 | January  February |
| Use degree measure and convert between degrees and radians. | 2.2 | January  February |
| Use angles to model and solve real life problems. | 2.3 | January  February |
| Identify the unit circle and describe its relationship to real numbers. | 2.2 | January  February |
| Evaluate trigonometric functions using the unit circle. | 2.2 | January  February |
| Use domain and period to evaluate sine and cosine functions. | 2.2 | January  February |
| Use a calculator to evaluate trigonometric functions. | 2.2 | January  February |
| Evaluate trigonometric functions of acute angles. | 2.2 | January  February |
| Use fundamental trigonometric identities. | 2.2 | January  February |
| Use trigonometric identities to solve and model real life problems. | 2.2 | January  February |
| Evaluate trigonometric functions of any angle. | 2.2 | January  February |
| Find reference angles. | 2.2 | January  February |
| Evaluate trigonometric functions of real numbers. | 2.2 | January  February |
| Sketch the graphs of basic sine and cosine functions. | 2.2 | January  February |
| Use amplitude and period to sketch the graphs of sine and cosine functions. | 2.2 | January  February |
| Sketch translations of graphs of sine and cosine functions. | 2.2 | January  February |
| Use sine and cosine functions to model real life data. | 2.2 | January  February |
| Sketch the graph of tangent functions. | 2.2 | January  February |

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| Sketch the graph of cotangent functions. | 2.2 | January  February |
| Sketch the graph of secant and cosecant functions. | 2.2 | January  February |
| Evaluate and graph inverse sine functions. | 2.2 | January  February |
| Evaluate and graph other inverse functions. | 2.2 | January  February |
| Evaluate composition of trigonometric functions. | 2.2 | January  February |
| Solve real life problems involving right triangles. | 2.2, 2.3 | January  February |
| Solve real life problems involving directional bearings. | 2.2 | January  February |
| Solve real life problems involving harmonic motion. | 2.2 | January  February |
| Recognize and write the fundamental trigonometric identities. | 2.2 | February  March |
| Use the fundamental trigonometric identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions. | 2.2 | February  March |
| Verify trigonometric identities. | 2.2 | February  March |
| Use standard algebraic techniques to solve trigonometric equations. | 2.2 | February  March |
| Solve trigonometric equations of quadratic type. | 2.2 | February  March |
| Solve trigonometric equations involving multiple angles. | 2.2 | February  March |
| Use inverse trigonometric functions to solve trigonometric equations. | 2.2 | February  March |
| Use sum and difference formulas to evaluate trigonometric functions, verify trigonometric identities, and solve trigonometric equations. | 2.2 | February  March |
| Use multiple-angle formulas to rewrite and evaluate trigonometric functions. | 2.2 | February  March |
| Use power-reducing formulas to rewrite and evaluate trigonometric functions. | 2.2 | February  March |
| Use half-angle formulas to rewrite and evaluate trigonometric functions. | 2.2 | February  March |
| Use product-to-sum and sum-to-product formulas to rewrite and evaluate trigonometric functions. | 2.2 | February  March |
| Use the Law of Sines to solve oblique triangles. | 2.2 | March  April |
| Find areas of oblique triangles and use the Law of Sines to model and solve real-life problems. | 2.2 | March  April |
| Use the Law of Cosines to solve oblique triangles. | 2.2 | March  April |
| Use the Law of Cosines to model and solve real-life problems. | 2.2 | March  April |
| Use Heron’s Area Formula to find areas of triangles. | 2.2 | March  April |

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| **THE FOLLOWING ARE OPTIONAL PERFORMANCE INDICATORS.** |  |  |
| Use the methods of substitution and graphing to solve systems of equations in two variables. | 2.2 | April  May |
| Use systems of equations to model and solve real-life problems. | 2.2 | April  May |
| Use the method of elimination to solve systems of linear equations in two variables. | 2.2 | April  May |
| Graphically interpret the number of solutions of a system of linear equations in two variables. | 2.2 | April  May |
| Use systems of linear equations in two variables to model and solve real-life problems. | 2.2 | April  May |
| Use back-substitution to solve linear systems in row-echelon form. | 2.2 | April  May |
| Use Gaussian elimination to solve systems of linear equations. | 2.2 | April  May |
| Solve non square systems of linear equations. | 2.2 | April  May |
| Graphically interpret three-variable linear systems. | 2.2 | April  May |
| Use systems of linear equations to write partial fraction decompositions of rational expressions. | 2.2 | April  May |
| Use systems of linear equations in three or more variables to model and solve real-life problems. | 2.2 | April  May |
| Write matrices and determine their dimensions. | 2.2 | April  May |
| Perform elementary row operations on matrices. | 2.2 | April  May |
| Use matrices and Gauss-Jordan elimination to solve systems of linear equations. | 2.2 | April  May |
| Decide whether two matrices are equal. | 2.2 | April  May |
| Add and subtract matrices and multiply matrices by scalars. | 2.2 | April  May |
| Multiply two matrices. | 2.2 | April  May |
| Use matrix operations to model and solve real-life problems. | 2.2 | April  May |
| Verify that two matrices are inverses of each other. | 2.2 | April  May |
| Use Gauss-Jordan elimination to find inverses of matrices. | 2.2 | April  May |
| Use a formula to find inverses of 2x2 matrices. | 2.2 | April  May |
| Use inverse matrices to solve systems of linear equations. | 2.2 | April  May |
| Find the determinants of 2x2 matrices. | 2.2 | April  May |
| Find the determinants of square matrices. | 2.2 | April  May |
| Recognize a conic as the intersection of a plane and a double-napped cone. | 2.2 | May  June |
| Write equations of circles in standard form. | 2.2 | May  June |
| Write equations of parabolas in standard form. | 2.2 | May  June |
| Use the reflective property of parabolas to solve real-life problems. | 2.2 | May  June |
| Write equations of ellipses in standard form. | 2.2 | May  June |
| Use properties of ellipses to model and solve real-life problems. | 2.2 | May  June |
| Find eccentricities of ellipses. | 2.2 | May  June |
| Write equations of hyperbolas in standard form. | 2.2 | May  June |
| Find asymptotes of and graph hyperbolas. | 2.2 | May  June |
| Use properties of hyperbolas to solve real-life problems. | 2.2 | May  June |
| Classify conics from their general equations. | 2.2 | May  June |

**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 Ticket, Cooperative Learning, Observations, Written work, Quizzes, Oral response, Self-evaluation, 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, Tests