WARREN COUNTY SCHOOL DISTRICT

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Honors Pre-Calculus
Course Number: 00271
Course Prerequisites: Recommended grade average of 80% or higher in Honors Algebra II and Honors Geometry

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. Major topics include the study of 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 Honors or Advanced Placement Calculus AB. District marking period assessments and final exam are required.

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:
CSPG #50 Mathematics (7-12)
To find the CSPG information, go to CSPG
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, download the Excel file for *SCED*, click on SCED 6.0 tab, and choose 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 with CalcChat and CalcView, 8e*
Publisher:	Cengage Learning
ISBN #:	978-1-337-90428-5
Copyright Date:	2020
WCSD Board Approval Date:	6/29/2020

Supplemental Materials: Kuta Software, pdesas.org, Khan Academy, Desmos, TI-89 Titanium Graphing Calculator

Curriculum Document

WCSD Board Approval:

Date Finalized:	5/23/2022
Date Approved:	6/13/2022
Implementation Year:	2022-2023

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, AND CONCEPTS

Marking Period 1: Polynomial and Rational Functions, and Exponential and Logarithmic Functions

- Quadratic Functions
- Polynomial Functions of Higher Degree
- Real Zeros of Polynomial Functions
- Complex Numbers
- The Fundamental Theorem of Algebra
- Review: Operations of Rational Functions
- Rational Functions and Asymptotes
- Graphs of Rational Functions
- Quadratic Models
- Exponential Functions and Their Graphs
- Logarithmic Functions and Their Graphs
- Properties of Logarithms
- Marking Period 1 Review and Assessment

Marking Period 2: Exponential and Logarithmic Equations, and Trigonometric Functions

- Exponential and Logarithmic Equation: Solving
- Exponential and Logarithmic Models
- Nonlinear Models
- Radian and Degree Measure
- Trigonometric Functions: The Unit Circle
- Right Triangle Trigonometry
- Trigonometric Functions of Any Angle
- Graphs of Sine and Cosine Functions
- Graphs of Other Trigonometric Functions
- Inverse Trigonometric Functions
- Application and Models
- Mid-Term Review and Assessment

Marking Period 3: Analytic Trigonometry, Law of Sines, and Law of Cosines

- Fundamental Identities
- Verification of Trigonometric Identities
- Trigonometric Equations
- Sum and Difference Formulas
- Multiple-Angle and Product-to-Sum Formulas
- Law of Sines
- Law of Cosines
- Marking Period 3 Review and Assessment

Marking Period 4: Linear Systems and Matrices, and Analytic Geometry

- Systems of Equations: Solving
- Systems of Linear Equations in Two Variables
- Multivariable Linear Systems
- Matrices and Systems of Equations
- Operations with Matrices
- The Inverse of a Square Matrix
- The Determinant of a Square Matrix
- Circles and Parabolas
- Ellipses
- Hyperbolas
- Final Exam Review and Assessment

Standards/Eligible Content and Skills

Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Analyze graphs of quadratic functions	CC.2.2.HS.C.5 CC.2.2.HS.D.7 CC.2.2.HS.D.10	MP1
Write quadratic functions in standard form and use the results to sketch graphs of functions	CC.2.2.HS.D.10	MP1
Find minimum and maximum values of quadratic functions in real-world and mathematical problems	CC.2.2.HS.C.6 F-IF.7A	MP1
Use transformations to sketch graphs of polynomial functions	CC.2.2.HS.C.4 F-BF.3	MP1
Use the Leading Coefficient Test to graph end behavior of polynomial functions	F-IF.7C	MP1
Find and use zeros of polynomial functions as sketching aides	CC.2.2.HS.D.4 F-IF.7C	MP1
Use the Intermediate Value Theorem to locate zeros of polynomial functions	CC.2.2.HS.D.4	MP1
Use long division to divide polynomials by other polynomials	CC.2.2.HS.D.3 A-APR.6	MP1
Use synthetic division to divide polynomials by binomials	CC.2.2.HS.D.3 A-APR.2	MP1
Use the remainder and factor theorems	CC.2.2.HS.D.3 A-APR.2	MP1
Use the Rational Zero Test to determine possible rational zeros of polynomial functions	CC.2.2.HS.D.3	MP1
Use the Descartes' Rules of Signs and the upper and lower bounds to find real zeros of polynomials	CC.2.2.HS.D.3	MP1
Use the imaginary unit i to write complex numbers	CC.2.1.HS.F.6	MP1
Add, subtract, and multiply complex numbers	CC.2.1.HS.F.6	MP1
Use complex conjugates to write the quotient of two complex numbers in standard form	CC.2.1.HS.F.6	MP1
Find the complex solutions of quadratic equations	CC.2.1.HS.F.7	MP1
Use the Fundamental Theorem of Algebra to determine the number of zeros of a polynomial function	CC.2.2.HS.D.4	MP1
Find all zeros of polynomial functions	CC.2.2.HS.D.4	MP1
Find conjugate pairs of complex zeros	CC.2.2.HS.D.4	MP1
Find zeros of polynomials by factoring	CC.2.2.HS.D.4	MP1
Review: Add, subtract, multiply, and divide rational functions	CC.2.2.HS.D.6 A-APR.6	MP1
Find the domains of rational functions	F-IF.5 F-IF.7	MP1
Find the vertical and horizontal asymptotes of rational functions	CC.2.2.HS.C.2 F-IF.7 F-IF.7D	MP1

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
Use rational functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.2 CC.2.2.HS.C.6	MP1
Analyze and sketch graphs of rational functions	CC.2.2.HS.C.2 F-IF.7	MP1
Sketch graphs of rational functions that have slant asymptotes	F-IF.7 F-IF.7D	MP1
Use graphs of rational functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-IF.7	MP1
Classify quadratic scatterplots	CC.2.2.HS.C.5 S-ID.6	MP1
Use a graphing utility to find quadratic models of data from a scatterplot	CC.2.2.HS.C.6 S-ID.6	MP1
Determine the quadratic model that best fits a set of data	CC.2.2.HS.C.6 S-ID.6	MP1
Recognize and evaluate exponential functions with base a	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-LE.4	MP1
Graph exponential functions with base a	F-IF.7E	MP1
Recognize, evaluate, and graph exponential functions with base e	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-IF.7E F-LE.4	MP1
Use exponential functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.5 CC.2.2.HS.C.6	MP1
Recognize and evaluate logarithmic functions with base a	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-LE.4	MP1
Graph logarithmic functions with base a	F-IF.7E	MP1
Recognize, evaluate, and graph natural logarithmic functions	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-IF.7E F-LE.4	MP1
Use logarithmic functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.5 CC.2.2.HS.C.6	MP1
Rewrite logarithms with different bases	CC.2.2.HS.D.2 F-BF.5	MP1
Use properties of logarithms to evaluate/review logarithmic expressions	CC.2.2.HS.D.2 F-BF.5	MP1
Use properties of logarithms to expand/condense logarithmic expressions	CC.2.2.HS.D.2 F-BF.5	MP1
Use logarithmic functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.5 CC.2.2.HS.C.6 F-BF.5	MP1
Marking Period 1 Review and Assessment		MP1

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
• Review and extend knowledge of Polynomial and Rational Functions		MP1
• Review and extend knowledge of Exponential and Logarithmic Functions		MP1
Solve simple exponential and logarithmic equations	CC.2.2.HS.C.5 CC.2.2.HS.D.2	MP2
Solve more complicated exponential equations	CC.2.2.HS.C.5 CC.2.2.HS.D.2	MP2
Solve more complicated logarithmic equations	CC.2.2.HS.C.5 CC.2.2.HS.D.2	MP2
Model and solve real-world and mathematical problems using exponential and logarithmic equations	CC.2.2.HS.C.5 CC.2.2.HS.C.6 CC.2.2.HS.D.2	MP2
Recognize the five most common types of models of exponential and logarithmic functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying exponential growth and exponential decay functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying Gaussian functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying logistic growth functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying logarithmic functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Classify exponential and logarithmic scatterplots	CC.2.2.HS.C.5 S-ID.6	MP2
Use a graphing utility to find exponential and logarithmic models of data from a scatterplot	CC.2.2.HS.C.6 S-ID.6A	MP2
Determine the exponential or logarithmic model that best fits a set of data	CC.2.2.HS.C.6 S-ID.6A	MP2
Use a graphing utility to find exponential and logistic models for data	CC.2.2.HS.C.6 S-ID.6	MP2
Describe angles	G-CO.1	MP2
Use radian measure	F-TF.1	MP2
Use degree measure and convert between degrees and radians	F-TF.1	MP2
Model and solve real-world and mathematical problems using angles	CC.2.3.HS.A.14	MP2
Identify and describe the unit circle and its relationship to real numbers	CC.2.2.HS.C.7 F-TF.2	MP2
Evaluate trigonometric functions using the unit circle	CC.2.2.HS.C.7 F-TF.2	MP2

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
Use the domain and period to evaluate sine and cosine functions	CC.2.2.HS.C.7 F-TF.3	MP2
Use a calculator to evaluate trigonometric functions	F-TF.7	MP2
Evaluate trigonometric functions of acute angles and use a graphing calculator to evaluate the trigonometric functions	CC.2.3.HS.A.7 F-TF.3	MP2
Use the fundamental trigonometric identities	CC.2.2.HS.C.9 CC.2.3.HS.A.7 F-TF.3	MP2
Model and solve real-world and mathematical problems applying trigonometric identities	CC.2.2.HS.C.9 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP2
Evaluate trigonometric functions of any angle	CC.2.2.HS.C.9 F-TF.2 G-SRT.8	MP2
Find reference angles	CC.2.2.HS.C.1 CC.2.2.HS.C.9 F-TF.2 G-SRT.8	MP2
Evaluate trigonometric functions of real numbers	CC.2.2.HS.C.9 F-TF.2 G-SRT.8	MP2
Sketch the graphs of basic sine and cosine functions	CC.2.2.HS.C.8 F-IF.7	MP2
Use the amplitude and period to sketch the graphs of the sine and cosine functions	CC.2.2.HS.C.8 F-IF.7 F-TF.5	MP2
Sketch translations of the graphs of sine and cosine functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-BF.3 F-IF.7 F-TF.5	MP2
Use sine and cosine functions to model real-world data	CC.2.2.HS.C.8 CC.2.3.HS.A.14 F-TF.5 G-SRT.8	MP2
Sketch the graphs of tangent functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-BF.3 F-IF.7 F-TF.5	MP2
Sketch the graphs of cotangent functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-BF.3 F-IF.7 F-TF.5	MP2
Sketch the graphs of secant and cosecant functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-BF.3 F-IF.7 F-TF.5	MP2

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
Sketch the graphs of damped trigonometric functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-BF.3 F-IF.7 F-TF.5	MP2
Evaluate and graph inverse sine functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-TF.5 F-TF.6	MP2
Evaluate and graph the other inverse trigonometric functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-TF.5 F-TF.6	MP2
Evaluate compositions of trigonometric functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-TF.6	MP2
Solve real-world and mathematical problems involving right triangles	CC.2.2.HS.C.3 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP2
Solve real-world and mathematical problems involving directional bearings	CC.2.2.HS.C.3 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP2
Solve real-world and mathematical problems involving harmonic motion	CC.2.2.HS.C.3 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP2
Mid-Term Review and Assessment		MP2
• Review and extend knowledge of Polynomial and Rational Functions		MP2
• Review and extend knowledge of Exponential and Logarithmic Functions		MP2
• Review and extend knowledge of Exponential and Logarithmic Equations		MP2
• Review and extend knowledge of Trigonometric Functions		MP2
Recognize and write the Fundamental Trigonometric Identities	CC.2.2.HS.C.1 CC.2.2.HS.C.6 F-TF.8	MP3
Use the Fundamental Trigonometric Identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions	CC.2.2.HS.C.1 CC.2.2.HS.C.6 F-TF.8	MP3
Verify trigonometric identities	CC.2.2.HS.C.1 CC.2.2.HS.C.6 F-TF.8	MP3

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
Use standard algebraic techniques to solve trigonometric equations	CC.2.2.HS.D.10 F-TF.7	MP3
Solve trigonometric equations of the quadratic type	CC.2.2.HS.D.10 F-TF.7	MP3
Solve trigonometric equations involving multiple angles	CC.2.2.HS.D.10 F-TF.7	MP3
Use inverse trigonometric functions to solve trigonometric equations	CC.2.2.HS.C.1 F-TF.7	MP3
Use the sum and difference formulas to evaluate trigonometric functions, verify trigonometric identities, and solve trigonometric equations	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP3
Use multiple-angle formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP3
Use power-reducing formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP3
Use half-angle formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP3
Use product-to-sum and sum-to-product formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP3
Use the Law of Sines to solve oblique triangles: AAS, ASA, SSA	CC.2.3.HS.A.14 G-SRT.10	MP3
Find areas of oblique triangles	CC.2.3.HS.A.14 G-SRT.10 G-SRT.11	MP3
Model and solve real-world and mathematical problems applying the Law of Sines	CC.2.3.HS.A.14 G-SRT.10 G-SRT.11	MP3
Use the Law of Cosines to solve oblique triangles: SSS, SAS	CC.2.3.HS.A.14 G-SRT.10	MP3
Model and solve real-world and mathematical problems applying the Law of Cosines	CC.2.3.HS.A.14 G-SRT.10 G-SRT.11	MP3
Use Heron's Area Formula to find the area of triangles	CC.2.3.HS.A.14	MP3
Marking Period 3 Review and Assessment		MP3
• Review and extend knowledge of Analytic Trigonometry		MP3
• Review and extend knowledge of the Law of Sines and the Law of Cosines		MP3
Use the methods of substitution and graphing to solve systems of equations in two variables	CC.2.2.HS.D.10	MP4

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
Use systems of equations to model and solve real-world and mathematical problems	CC.2.2.HS.C.6 CC.2.2.HS.D.10	MP4
Use the method of elimination to solve systems of linear equations in two variables	CC.2.2.HS.D.10	MP4
Graphically interpret the number of solutions of a system of linear equations in two variables	CC.2.2.HS.D.10 A-CED.3	MP4
Use systems of linear equations in two variables to model and solve real-world and mathematical problems	CC.2.2.HS.C.6 CC.2.2.HS.D.10	MP4
Use back-substitution to solve linear systems in row-echelon form	CC.2.2.HS.D.10	MP4
Use Gaussian elimination to solve systems of linear equations	CC.2.2.HS.D.10	MP4
Solve non-square systems of linear equations	CC.2.2.HS.D.10	MP4
Graphically interpret three-variable linear systems	CC.2.2.HS.D.10 A-CED.3	MP4
Use systems of linear equations to write partial fraction decompositions of rational expressions	CC.2.2.HS.C.6 CC.2.2.HS.D.10	MP4
Use systems of linear equations in three or more variables to model and solve real-world and mathematical problems	CC.2.2.HS.C.6 CC.2.2.HS.D.10	MP4
Write matrices and determine their dimensions	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Perform elementary row operations on matrices	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Use matrices and Gaussian elimination to solve systems of linear equations	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Use matrices and Gaussian-Jordan elimination to solve systems of linear equations	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Decide whether two matrices are equal	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Add and subtract matrices and multiply matrices by scalars	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Multiply two matrices	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Use matrix operations to model and solve real-world and mathematical problems	CC.2.2.HS.D.2 CC.2.2.HS.D.10	MP4
Verify that two matrices are inverses of each other	CC.2.2.HS.D.2 CC.2.2.HS.D.10 A-REI.9	MP4
Use Gauss-Jordan elimination to find inverses of matrices	CC.2.2.HS.D.2 CC.2.2.HS.D.10 A-REI.9	MP4
Use a formula to find inverses of 2 x 2 matrices	CC.2.2.HS.D.2 CC.2.2.HS.D.10 A-REI.9	MP4

Performance Indicator	**PA Core Standard and/or Eligible Content**	**Marking Period Taught**
Use inverse matrices to solve systems of linear equations	CC.2.2.HS.D.2 CC.2.2.HS.D.10 A-REI.9	MP4
Find the determinants of 2 x 2 matrices	CC.2.2.HS.D.2 CC.2.2.HS.D.10 A-REI.9	MP4
Find minors and cofactors of square matrices	CC.2.2.HS.D.2 CC.2.2.HS.D.10 A-REI.9	MP4
Find the determinants of square matrices	CC.2.2.HS.D.2 CC.2.2.HS.D.10 A-REI.9	MP4
Recognize a conic as the intersection of a plane and a double-napped cone	G-GMD.4	MP4
Write equations of circles in standard form	CC.2.3.HS.A.10 G-GPE.1	MP4
Write equations of parabolas in standard form	CC.2.3.HS.A.10 G-GPE.2	MP4
Use the reflective property of parabolas to solve real-world and mathematical problems	CC.2.3.HS.A.10 CC.2.3.HS.A.14 G-GPE.2	MP4
Write equations of ellipses in standard form	CC.2.3.HS.A.10 G-GPE.3	MP4
Use properties of ellipses to model and solve real-world and mathematical problems	CC.2.3.HS.A.10 CC.2.3.HS.A.14 G-GPE.3	MP4
Find eccentricities of ellipses	CC.2.3.HS.A.10 G-GPE.3	MP4
Write equations of hyperbolas in standard form	CC.2.3.HS.A.10 G-GPE.3	MP4
Find asymptotes of and graph hyperbolas	CC.2.3.HS.A.10 G-GPE.3	MP4
Use properties of hyperbolas to solve real-world and mathematical problems	CC.2.3.HS.A.10 CC.2.3.HS.A.14 G-GPE.3	MP4
Classify conics from their general equations	CC.2.3.HS.A.10	MP4
Final Exam Review and Assessment		MP4
• Review and extend knowledge of Analytic Trigonometry		MP4
• Review and extend knowledge of the Law of Sines and Law of Cosines		MP4
• Review and extend knowledge of Linear Systems and Matrices		MP4
• Review and extend knowledge of topics in Analytic Geometry		MP4

ASSESSMENTS

PDE 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:

- Pre-assessments of prior knowledge (e.g., Entrance cards or KWL chart)
- Bellringers/Problems of the Day (PODs)
- Discussions
- Exit ticket
- Teacher observations/Questioning
- Graphic organizers (e.g., Venn Diagrams, word mapping, webbing, KWL chart, etc.)
- Outlining
- Cooperative learning
- Written work
- Quizzes
- Oral response
- Self-evaluation
- Homework
- Summarizing
- Note-taking

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
- Quizzes
- Marking period assessments
- Mid-Term exam
- Final exam
- Projects
- Student presentations