Pre-Calculus Honors (#1202340) 2022 – 2023 Course Description

Course Title:	Pre-Calculus Honors
Course Number:	1202340
Course Information:	**In Precalculus Honors, instructional time will emphasize six areas:** (1) extending right triangle trigonometry to unit circle trigonometry and trigonometric functions; (2) extending understanding of functions to trigonometric; (3) developing understanding of conic sections; (4) representing and performing operations with complex numbers and vectors in the coordinate plane; (5) extending understanding of relations in the plane using parametric representations, including polar coordinates and (6) analyzing arithmetic and geometric sequences and series. *All clarifications stated, whether general or specific to Precalculus Honors, are expectations for instruction of that benchmark.* Curricular content for all subjects must integrate critical-thinking, problem-solving, and workforce-literacy skills; communication, reading, and writing skills; mathematics skills; collaboration skills; contextual and applied-learning skills; technology-literacy skills; information and media-literacy skills; and civic-engagement skills.
General Notes:	**Honors and Accelerated Level Course Note:** Accelerated courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work. **Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards** This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package. **English Language Development ELD Standards Special Notes Section:** Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Mathematics. For the

	given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/ma.pdf

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards: 7 Mathematical Thinking and Reasoning Standards, 65 Mathematics Benchmarks, 6 English Language Arts Benchmarks and 1 English Language Development Benchmark

7 Mathematical Thinking and Reasoning Standards		**Textbook Section**
MA.K12.MTR.1.1:	Mathematicians who participate in effortful learning both individually and with others: ● Analyze the problem in a way that makes sense given the task. ● Ask questions that will help with solving the task. ● Build perseverance by modifying methods as needed while solving a challenging task. ● Stay engaged and maintain a positive mindset when working to solve tasks. ● Help and support each other when attempting a new method or approach. Clarifications: Teachers who encourage students to participate actively in effortful learning both individually and with others: ● Cultivate a community of growth mindset learners. ● Foster perseverance in students by choosing tasks that are challenging. ● Develop students' ability to analyze and problem solve. ● Recognize students' effort when solving challenging problems.	Incorporated Throughout
MA.K12.MTR.2.1:	Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways: ● Build understanding through modeling and using manipulatives. ● Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations. ● Progress from modeling problems with objects and drawings to using algorithms and equations. ● Express connections between concepts and representations. ● Choose a representation based on the given context or purpose. Clarifications: Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:	Incorporated Throughout

	• Help students make connections between concepts and representations. • Provide opportunities for students to use manipulatives when investigating concepts. • Guide students from concrete to pictorial to abstract representations as understanding progresses. • Show students that various representations can have different purposes and can be useful in different situations.	
MA.K12.MTR.3.1:	Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency: • Select efficient and appropriate methods for solving problems within the given context. • Maintain flexibility and accuracy while performing procedures and mental calculations. • Complete tasks accurately and with confidence. • Adapt procedures to apply them to a new context. • Use feedback to improve efficiency when performing calculations. Clarifications: Teachers who encourage students to complete tasks with mathematical fluency: • Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately. • Offer multiple opportunities for students to practice efficient and generalizable methods. • Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.	Incorporated Throughout
MA.K12.MTR.4.1:	Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others: • Communicate mathematical ideas, vocabulary and methods effectively. • Analyze the mathematical thinking of others. • Compare the efficiency of a method to those expressed by others. • Recognize errors and suggest how to correctly solve the task. • Justify results by explaining methods and processes. • Construct possible arguments based on evidence. Clarifications: Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others: • Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning. • Create opportunities for students to discuss their thinking with peers. • Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.	Incorporated Throughout

	• Develop students' ability to justify methods and compare their responses to the responses of their peers.	
MA.K12.MTR.5.1:	Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts: • Focus on relevant details within a problem. • Create plans and procedures to logically order events, steps or ideas to solve problems. • Decompose a complex problem into manageable parts. • Relate previously learned concepts to new concepts. • Look for similarities among problems. • Connect solutions of problems to more complicated large-scale situations. Clarifications: Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts: • Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts. • Support students to develop generalizations based on the similarities found among problems. • Provide opportunities for students to create plans and procedures to solve problems. • Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.	Incorporated Throughout
MA.K12.MTR.6.1:	Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions: • Estimate to discover possible solutions. • Use benchmark quantities to determine if a solution makes sense. • Check calculations when solving problems. • Verify possible solutions by explaining the methods used. • Evaluate results based on the given context. Clarifications: Teachers who encourage students to assess the reasonableness of solutions: • Have students estimate or predict solutions prior to solving. • Prompt students to continually ask, "Does this solution make sense? How do you know?" • Reinforce that students check their work as they progress within and after a task. • Strengthen students' ability to verify solutions through justifications.	Incorporated Throughout
MA.K12.MTR.7.1:	Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts: • Connect mathematical concepts to everyday experiences. • Use models and methods to understand, represent and solve problems.	Incorporated Throughout

	• Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency. Clarifications: Teachers who encourage students to apply mathematics to real-world contexts: • Provide opportunities for students to create models, both concrete and abstract, and perform investigations. • Challenge students to question the accuracy of their models and methods. • Support students as they validate conclusions by comparing them to the given situation. • Indicate how various concepts can be applied to other disciplines.	
65 B.E.S.T. Mathematics Benchmarks		
MA.912.AR.5.7:	Solve and graph mathematical and real-world problems that are modeled with exponential functions. Interpret key features and determine constraints in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; constant percent rate of change; end behavior and asymptotes. *Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation. *Clarification 3*: Instruction includes understanding that when the logarithm of the dependent variable is taken and graphed, the exponential function will be transformed into a linear function. *Clarification 4*: Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.	5.3, 5.6, 5.8
MA.912.AR.5.9:	Solve and graph mathematical and real-world problems that are modeled with logarithmic functions. Interpret key features and determine constraints in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and asymptotes. *Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.	5.4, 5.6, 5.8
MA.912.AR.6.3:	Explain and apply theorems for polynomials to solve mathematical and real-world problems. **Clarifications:** *Clarification 1*: Theorems include the Factor Theorem and the Fundamental Theorem of Algebra.	4.3, 4.4
MA.912.AR.6.4:	Given a table, equation or written description of a polynomial function of degree 3 or higher, graph that function and determine its key features. **Clarifications:**	4.2

	Clarification 1: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetry; and end behavior. *Clarification 2*: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.	
MA.912.AR.6.6:	Solve and graph mathematical and real-world problems that are modeled with polynomial functions of degree 3 or higher. Interpret key features and determine constraints in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetry; and end behavior. *Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.	4.1
MA.912.AR.7.4:	Solve and graph mathematical and real-world problems that are modeled with radical functions. Interpret key features and determine constraints in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and relative maximums and minimums. *Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.	A10
MA.912.AR.8.3:	Solve and graph mathematical and real-world problems that are modeled with rational functions. Interpret key features and determine constraints in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; and asymptotes. *Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation. *Clarification 3*: Instruction includes using rational functions to represent inverse proportional relationships. *Clarification 4*: Within the Algebra 2 course, numerators and denominators are limited to linear and quadratic expressions.	A6, 4.5, 4.6
MA.912.AR.9.3:	Given a mathematical or real-world context, solve a system consisting of two-variable linear or non-linear equations algebraically or graphically. **Clarifications:** *Clarification 1*: Within the Algebra 2 course, non-linear equations are limited to quadratic equations.	11.6
MA.912.AR.9.10:	Solve and graph mathematical and real-world problems that are modeled with piecewise functions. Interpret key features and determine constraints in terms of the context. **Clarifications:**	2.4

	Clarification 1: Key features are limited to domain, range, intercepts, asymptotes and end behavior. *Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.	
MA.912.AR.10.1:	Given a mathematical or real-world context, write and solve problems involving arithmetic sequences.	12.1, 12.2, 12.3
MA.912.AR.10.2:	Given a mathematical or real-world context, write and solve problems involving geometric sequences.	12.1
MA.912.AR.10.3:	Recognize and apply the formula for the sum of a finite arithmetic series to solve mathematical and real-world problems.	12.2
MA.912.AR.10.4:	Recognize and apply the formula for the sum of a finite or an infinite geometric series to solve mathematical and real-world problems.	12.3
MA.912.AR.10.5:	Given a mathematical or real-world context, write a sequence using function notation, defined explicitly or recursively, to represent relationships between quantities from a written description.	12.2, 12.3
MA.912.F.1.4:	Write an algebraic expression that represents the difference quotient of a function. Calculate the numerical value of the difference quotient at a given pair of points. **Clarifications:** *Clarification 1*: Instruction focuses on making connections between difference quotients and slopes of lines.	2.1, 5.5, 7.5
MA.912.F.1.7:	Compare key features of two functions each represented algebraically, graphically, in tables or written descriptions. **Clarifications:** *Clarification 1*: Key features include domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior and asymptotes.	2.2, 2.3
MA.912.F.3.3:	Solve mathematical and real-world problems involving functions that have been combined using arithmetic operations.	2.6
MA.912.F.3.4:	Represent the composition of two functions algebraically or in a table. Determine the domain and range of the composite function.	5.1
MA.912.F.3.5:	Solve mathematical and real-world problems involving composite functions.	7.1
MA.912.F.3.7:	Represent the inverse of a function algebraically, graphically or in a table. Use composition of functions to verify that one function is the inverse of the other. **Clarifications:** *Clarification 1*: Instruction includes the understanding that a logarithmic function is the inverse of an exponential function.	5.2, 5.4, 7.1, 7.2, 7.3
MA.912.F.3.8:	Produce an invertible function from a non-invertible function by restricting the domain.	5.1, 7.1, 7.2,
MA.912.F.3.9:	Solve mathematical and real-world problems involving inverse functions.	5.2, 7.1, 7.2, 7.3

MA.912.GR.7.1:	Given a conic section, describe how it can result from the slicing of two cones.	10.1
MA.912.GR.7.2:	Given a mathematical or real-world context, derive and create the equation of a circle using key features. **Clarifications:** *Clarification 1:* Instruction includes using the Pythagorean Theorem and completing the square. *Clarification 2:* Within the Geometry course, key features are limited to the radius, diameter and the center.	1.6
MA.912.GR.7.3:	Graph and solve mathematical and real-world problems that are modeled with an equation of a circle. Determine and interpret key features in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain, range, eccentricity, center and radius. *Clarification 2*: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation. *Clarification 3*: Within the Geometry course, notations for domain and range are limited to inequality and set-builder.	1.6
MA.912.GR.7.4:	Given a mathematical or real-world context, derive and create the equation of a parabola using key features.	10.2
MA.912.GR.7.5:	Graph and solve mathematical and real-world problems that are modeled with an equation of a parabola. Determine and interpret key features in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain, range, eccentricity, intercepts, focus, focal width (latus rectum), vertex and directrix. *Clarification 2*: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.	10.2
MA.912.GR.7.6:	Given a mathematical or real-world context, derive and create the equation of an ellipse using key features.	10.3
MA.912.GR.7.7:	Graph and solve mathematical and real-world problems that are modeled with an equation of an ellipse. Determine and interpret key features in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain, range, eccentricity, center, foci, major axis, minor axis and vertices. *Clarification 2*: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.	10.3
MA.912.GR.7.8:	Given a mathematical or real-world context, derive and create the equation of a hyperbola using key features.	10.4
MA.912.GR.7.9:	Graph and solve mathematical and real-world problems that are modeled with an equation of a hyperbola. Determine and interpret key features in terms of the context. **Clarifications:** *Clarification 1*: Key features are limited to domain, range, eccentricity, center, vertices, foci, transverse axis, conjugate axis, asymptotes and directrices.	10.4

	Clarification 2: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.	
MA.912.NSO.2.2:	Represent addition, subtraction, multiplication and conjugation of complex numbers geometrically on the complex plane.	A.7, 9.3
MA.912.NSO.2.3:	Calculate the distance and midpoint between two numbers on the complex coordinate plane.	Supplement
MA.912.NSO.2.4:	Solve mathematical and real-world problems involving complex numbers represented algebraically or on the coordinate plane.	4.4
MA.912.NSO.2.5:	Represent complex numbers on the complex plane in rectangular and polar forms. **Clarifications:** *Clarification 1*: Instruction includes explaining why the rectangular and polar forms of a given complex numbers represent the same number.	9.3
MA.912.NSO.2.6:	Rewrite complex numbers to trigonometric form. Multiply complex numbers in trigonometric form.	9.3
MA.912.NSO.3.1:	Apply appropriate notation and symbols to represent vectors in the plane as directed line segments. Determine the magnitude and direction of a vector in component form.	9.4
MA.912.NSO.3.2:	Represent vectors in component form, linear form or trigonometric form. Rewrite vectors from one form to another.	9.4, 9.5
MA.912.NSO.3.3:	Solve mathematical and real-world problems involving velocity and other quantities that can be represented by vectors.	9.4, 9.5
MA.912.NSO.3.4:	Solve mathematical and real-world problems involving vectors in two dimensions using the dot product and vector projections.	9.5,
MA.912.NSO.3.6:	Multiply a vector by a scalar algebraically or graphically.	9.4, 9.5
MA.912.NSO.3.7:	Compute the magnitude and direction of a vector scalar multiple.	9.4
MA.912.NSO.3.8:	Add and subtract vectors algebraically or graphically.	9.4
MA.912.NSO.3.9:	Given the magnitude and direction of two or more vectors, determine the magnitude and direction of their sum.	9.4
MA.912.T.1.3:	Apply the Law of Sines and the Law of Cosines to solve mathematical and real-world problems involving triangles.	8.2, 8.3
MA.912.T.1.4:	Solve mathematical problems involving finding the area of a triangle given two sides and the included angle. **Clarifications:** *Clarification 1:* Problems include right triangles, heights inside of a triangle and heights outside of a triangle.	8.1, 8.4
MA.912.T.1.5:	Prove Pythagorean Identities. Apply Pythagorean Identities to calculate trigonometric ratios and to solve problems.	7.4 -7.7
MA.912.T.1.6:	Prove the Double-Angle, Half-Angle, Angle Sum and Difference formulas for sine, cosine, and tangent. Apply these formulas to solve problems.	7.5 -7.7

MA.912.T.1.7:	Simplify expressions using trigonometric identities. **Clarifications:** *Clarification 1:* Identities are limited to Double-Angle, Half-Angle, Angle Sum and Difference, Pythagorean Identities, Sum Identities and Product Identities.	6.1, 7.3 -7.7
MA.912.T.1.8:	Solve mathematical and real-world problems involving one-variable trigonometric ratios.	7.3
MA.912.T.2.1:	Given any positive or negative angle measure in degrees or radians, identify its corresponding angle measure between 0° and 360° or between 0 and 2π. Convert between degrees and radians.	6.1
MA.912.T.2.2:	Define the six basic trigonometric functions for all real numbers by identifying corresponding angle measures and using right triangles drawn in the unit circle.	6.2, 6.3
MA.912.T.2.3:	Determine the values of the six basic trigonometric functions for 0,, and and their multiples using special triangles.	6.3
MA.912.T.2.4:	Use the unit circle to express the values of sine, cosine and tangent for $\pi-x$, $\pi+x$, and $2\pi-x$ in terms of their values for x, where x is any real number.	6.2
MA.912.T.2.5:	Given angles measured in radians or degrees, calculate the values of the six basic trigonometric functions using the unit circle, trigonometric identities or technology.	6.2
MA.912.T.3.1:	Given a mathematical or real-world context, choose sine, cosine or tangent trigonometric functions to model periodic phenomena with specified amplitude, frequency, horizontal shift and midline.	6.4 - 6.6
MA.912.T.3.2:	Given a table, equation or written description of a trigonometric function, graph that function and determine key features. **Clarifications:** *Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetry; end behavior; periodicity; midline; amplitude; shift(s) and asymptotes. *Clarification 2*: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.	6.4 - 6.6
MA.912.T.3.3:	Solve and graph mathematical and real-world problems that are modeled with trigonometric functions. Interpret key features and determine constraints in terms of the context. Clarifications: *Clarification 1*: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetry; end behavior; periodicity; midline; amplitude; shift(s) and asymptotes. *Clarification 2*: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation. *Clarification 3*: Instruction includes using technology when appropriate.	6.4 - 6.6, 7.1, 7.2

MA.912.T.4.1:	Define and plot polar coordinates. Convert between polar coordinates and rectangular coordinates with and without the use of technology.	9.1
MA.912.T.4.2:	Represent equations given in rectangular coordinates in terms of polar coordinates. Represent equations given in polar coordinates in terms of rectangular coordinates.	9.1
MA.912.T.4.3:	Graph equations in the polar coordinate plane with and without the use of graphing technology.	9.2
MA.912.T.4.4:	Identify and graph special polar equations, including circles, cardioids, limacons, rose curves and lemniscates.	9.2
MA.912.T.4.5:	Sketch the graph of a curve in the plane represented parametrically, indicating the direction of motion.	10.7
MA.912.T.4.6:	Convert from a parametric representation of a plane curve to a rectangular equation, and convert from a rectangular equation to a parametric representation of a plane curve.	10.7
MA.912.T.4.7:	Apply parametric equations to model applications involving motion in the plane.	10.7

6 English Language Arts Benchmarks and 1 English Language Development Benchmark		**Textbook Section**
ELA.K12.EE.1.1:	Cite evidence to explain and justify reasoning. **Clarifications:** 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.	Incorporated Throughout
ELA.K12.EE.2.1:	Read and comprehend grade-level complex texts proficiently. **Clarifications:** See Text Complexity for grade-level complexity bands and a text complexity rubric.	Incorporated Throughout
ELA.K12.EE.3.1:	Make inferences to support comprehension. **Clarifications:** Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.	Incorporated Throughout
ELA.K12.EE.4.1:	Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations. **Clarifications:** In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.	Incorporated Throughout
ELA.K12.EE.5.1:	Use the accepted rules governing a specific format to create quality work. **Clarifications:** Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.	Incorporated Throughout
ELA.K12.EE.6.1:	Use appropriate voice and tone when speaking or writing.	Incorporated Throughout

	Clarifications: In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.	
ELD.K12.ELL.MA.1:	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.	Incorporated Throughout