LITCHFIELD PUBLIC SCHOOLS
Core Curriculum Scope and Sequence
Trigonometry/Pre-Calculus

Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

	CT Frameworks/Standards	Content and Skill Objectives Students will be able to:	Assessments	Resources
UNIT 1 FUNCTIONS AND GRAPHS 11 WEEKS	CT(Extended) 1.1a(1) Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric. CT(Extended) 1.1a(2) Analyze essential relations in a problem to determine possible functions that could model the situation. CT(Extended) 1.2a(1) Relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes, and	• Visualize, analyze, and understand data through various mathematical models, including numerical, algebraic, and graphical. • Use the graphing calculator to understand the limitations of technology, including grapher failure and hidden behavior. • Identify the graphs of the twelve basic functions. • Analyze functions (including the twelve basic functions) both algebraically and graphically for various properties including	Formative Assessments Include: Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets Quizzes: Encompass at least one objective given throughout the unit. Administered depending on student need. Common Unit Assessment – Assesses computation as well as critical thinking and problem	Textbook: Pre-Calculus: Graphical, Numerical, Algebraic (7^{th} edition) – Demana, Waits, Foley, and Kennedy Textbook –Related Resources: Student Solutions Manual Practice Workbook Solutions Manual Resource Manual Tests and Quizzes

	line of symmetry for that function. CT(Extended) 1.2a(2) Recognize the effect of changes in parameters of the graphs of functions or relations. CT(Extended) 1.3a(2) Combine, compose, and invert functions. CT(Core) 4.1a(1) Collect real world data and create meaningful graphical representations of the data. CT(Core) 4.1a(2) Develop, use, and explain applications and limitations of linear and nonlinear models and regression in a variety of contexts. CT(Extended) 4.1a(3) Recognize the limitations of mathematical models based on sample data as representations of real-world situations.	domain and range, continuity, intervals of increasing and decreasing, boundedness, local and absolute extrema, symmetry, asymptotes, and end behavior. • Build new functions from basic functions by adding, subtracting, multiplying, dividing, and composing functions. • Define functions and relations parametrically • Find inverses of functions and relations. • Algebraically and graphically represent translations, reflections, stretches, and shrinks of functions. • Identify appropriate basic functions with which to model real-world problems and be able to produce specific functions to model data, formulas, graphs, and verbal descriptions.	solving skills related to objectives covered in unit.	Online resources: www.awl.com/damana www.interactmath.com TI-84 Plus graphing calculator and SMARTBoard emulator Teacher-made SMARTBoard presentations

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UNIT 2 POLYNOMIAL, POWER, AND RATIONAL FUNCTIONS 6 WEEKS	CT(Extended) 1.1a(1) Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric. CT(Extended) 1.1a(2) Analyze essential relations in a problem to determine possible functions that could model the situation. CT(Extended) 1.1a(7) Apply the concepts of limits to sequences and asymptotic behavior of functions. CT(Extended) 1.2a(1) Relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes, and line of symmetry for that function.	• Recognize and graph linear and quadratic functions, and use these functions to model situations and solve problems. • Apply the concept of the slope of a linear function to average rate of change on a curve. • Sketch power functions of the form of $f(x) = kx^n$ (where k and a are rational numbers). • Graph polynomial functions, predict their end behavior, and find their real zeros using a graphing calculator and/or an algebraic method. • Divide polynomials using long division or synthetic division; to apply the Remainder Theorem, and Rational Zeros Theorem; and find upper and lower bounds for zeros of properties. • Factor polynomials with	Formative Assessments Include: Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets Quizzes Encompass at least one objective given throughout the unit. Administered depending on student need. Common Unit Assessment – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.	Textbook: Pre-Calculus: Graphical, Numerical, Algebraic (7^{th} edition) – Demana, Waits, Foley, and Kennedy Textbook–Related Resources: Student Solutions Manual Practice Workbook Solutions Manual Resource Manual Tests and Quizzes Onlineresources: www.awl.com/demana www.interactmath.com TI-84 Plus graphing calculator and SMARTBoard emulator Teacher-made SMARTBoard presentations

		real coefficients using factors with complex coefficients. • Describe the graphs of rational functions, identify any horizontal, vertical, and oblique (slant) asymptotes, and predict end behavior. • Solve equations involving fractions using both algebraic and graphical techniques and identify extraneous solutions. • Solve inequalities involving polynomials and rational functions by using both algebraic and graphical techniques.		

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UNIT 3 EXPONENTIAL AND LOGARITHMIC FUNCTIONS 6 WEEKS	CT(Extended) 1.1a(1) Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric. CT(Extended) 1.1a(2) Analyze essential relations in a problem to determine possible functions that could model the situation. CT(Extended) 1.1a(4) Solve problems involving financial applications including compound interest, amortization of loans, and investments. CT(Extended) 1.2a(1) Relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes, and line of symmetry for that function. CT(Extended) 1.3a(3) Use logarithms, vectors,	• Evaluate exponential expressions and identify and graph exponential functions. • Use exponential growth, decay, and regression to model real-life problems. • Convert equations between logarithmic form and exponential form, evaluate common and natural logarithms, and graph common and natural logarithms. • Apply the properties of logarithms to evaluate expressions and graph functions. • Apply the properties of logarithms to solve exponential and logarithmic equations algebraically and solve application problems using these equations. • Use exponential functions and equations to solve business and finance applications related to compound interest and annuities.	<u>Formative Assessments Include</u>: Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets <u>Quizzes</u> Encompass at least one objective given throughout the unit. Administered depending on student need. <u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.	<u>Textbook</u>: Pre-Calculus: Graphical, Numerical, Algebraic (7^{th} edition) – Demana, Waits, Foley, and Kennedy <u>Textbook –Related Resources</u>: Student Solutions Manual Practice Workbook Solutions Manual Resource Manual Tests and Quizzes <u>Online resources</u>: www.awl.com/demana www.interactmath.com TI-84 Plus graphing calculator and SMARTBoard emulator Teacher-made SMARTBoard presentations

	and matrices to solve problems. CT(Extended) 2.2a(2) Perform operations with complex numbers, matrices, determinants, and logarithms.			

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UNIT 4 TRIGONOMETRIC FUNCTIONS 7 WEEKS	CT(Extended) 1.1a(1) Describe and compare properties and classes of functions, including exponential, polynomial, rational, logarithmic and trigonometric. CT(Extended) 1.1a(2) Analyze essential relations in a problem to determine possible functions that could model the situation. CT(Extended) 1.2a(1) Relate the graphical representation of a function to its function family and find equations, intercepts, maximum or minimum values, asymptotes, and line of symmetry for that function. CT(Extended) 1.3a(2) Combine, compose, and invert functions. CT(Core) 2.2b(1) Use dimensional analysis to determine equivalent rates. CT(Core) 3.3a(2) Use	• Convert between radians and degrees, find arc lengths, convert to nautical miles, and solve problems involving angular speed. • Define the six trigonometric functions using the lengths of the sides of a right triangle. • Solve problems involving trigonometric functions of real numbers and the properties of the sine and cosine as periodic functions. • Generate the graphs of the six trigonometric functions and explore various transformations of these graphs. • Relate the concept of inverse functions to trigonometric functions. • Apply the concepts of trigonometry to solve real world problems.	Formative Assessments Include: Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets Quizzes Encompass at least one objective given throughout the unit. Administered depending on student need. Common Unit Assessment – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.	Textbook: Pre-Calculus: Graphical, Numerical, Algebraic (7^{th} edition) – Demana, Waits, Foley, and Kennedy Textbook –Related Resources: Student Solutions Manual Practice Workbook Solutions Manual Resource Manual Tests and Quizzes Online resources: www.awl.com/demana www.interactmath.com www.embeddedmath.com – Free Math Worksheet Section – The Unit Circle – Trig Graph Paper TI-84 Plus graphing calculator and SMARTBoard emulator

	indirect methods including the Pythagorean Theorem, trigonometric ratios, and proportions in similar figures to solve a variety of measurement problems. CT(Extended) 3.3a(2) Use properties of similarity and techniques of trigonometry to make indirect measurements of lengths and angles to solve a variety of problems.			Teacher-made SMARTBoard presentations

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UNIT 5 ANALYTIC TRIGONOMETRY 6 WEEKS	CT(Core) 3.3a(2) Use indirect methods including the Pythagorean Theorem, trigonometric ratios, and proportions in similar figures to solve a variety of measurement problems. CT(Extended) 3.3a(2) Use properties of similarity and techniques of trigonometry to make indirect measurements of lengths and angles to solve a variety of problems.	• Use the fundamental identities to simplify trigonometric expressions and solve trigonometric equations. • Decide whether an equation is an identity and to confirm identities analytically. • Apply the identities for the cosine, sine, and tangent of a sum or difference. • Apply the double-angle identities, power-reducing identities, and half-angle identities. • Understand the proof of the Law of Sines and use the computational applications of the Law of Sines to solve a variety of problems. • Apply the Law of Cosines to solve acute and obtuse triangles and to determine the area of a triangle in terms of the measurements of the sides and angles.	<u>Formative Assessments Include</u>: Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets <u>Quizzes</u> Encompass at least one objective given throughout the unit. Administered depending on student need. <u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.	<u>Textbook</u>: Pre-Calculus: Graphical, Numerical, Algebraic (7^{th} edition) – Demana, Waits, Foley, and Kennedy <u>Textbook –Related Resources</u>: Student Solutions Manual Practice Workbook Solutions Manual Resource Manual Tests and Quizzes <u>Online resources</u>: www.awl.com/demana www.interactmath.com www.embeddedmath.com – Free Math Worksheet Section – The Unit Circle – Trig Graph Paper TI-84 Plus graphing calculator and SMARTBoard emulator

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UNIT 6 AN INTRODUCTION TO CALCULUS 2 WEEKS	CT(Extended) 1.1a(7) Apply the concept of limits to sequences and asymptotic behavior of functions. CT(Extended) 1.2a(3) Recognize that the slope of the tangent line to a curve represents the rate of change.	• Determine the limit of a function graphically, algebraically, and numerically. • Use the properties of limits to evaluate one-sided limits, two-sided limits, and limits involving infinity graphically, algebraically, and numerically. • Determine which method (algebraic, graphic, or numeric) is most appropriate to use when evaluating a limit. • Use the concept of a limit to develop the Limit Definition of the Derivative and apply this definition to determine instantaneous rates of change for various functions. • Find the derivative of a function using the Power Rule and/or Product Rule and/or Quotient Rule.	<u>Formative Assessments Include</u>: Pre-Assessment Questioning Peer/self-evaluation Teacher observation Exercise sets <u>Quizzes</u> Encompass at least one objective given throughout the unit. Administered depending on student need. <u>Common Unit Assessment</u> – Assesses computation as well as critical thinking and problems solving skills related to objectives covered in unit.	<u>Textbook</u>: Pre-Calculus: Graphical, Numerical, Algebraic (7^{th} edition) – Demana, Waits, Foley, and Kennedy <u>Textbook –Related Resources</u>: Student Solutions Manual Practice Workbook Solutions Manual Resource Manual Tests and Quizzes <u>Online resources</u>: www.awl.com/demana www.interactmath.com TI-84 Plus graphing calculator and SMARTBoard emulator Teacher-made SMARTBoard presentations