

STRATFORD PUBLIC SCHOOLS

Stratford, Connecticut



“Tantum eruditi sunt liberi”
Only The Educated Are Free

Pre-Calculus Level 1 Curriculum

Adopted by the Board of Education on June 25, 2012

Irene Cornish
Superintendent

Elaine Watson
Assistant Superintendent

DISTRICT MISSION

The mission of the Stratford Public Schools is to develop a community of learners in which students acquire the knowledge, skills and confidence to meet the challenges of a changing and increasingly diverse 21st century society.

DISTRICT CORE VALUES

Students will acquire content knowledge, strengthen higher-order thinking, and develop character in order to address 21st century challenges.

BUNNELL HIGH SCHOOL BELIEFS

We believe teachers must work collaboratively in support of student learning and to model collaboration as a social skill with students. We believe that a rigorous curriculum for all students, an acceptance of diversity, and a culture that actively welcomes all learners will contribute to a more knowledgeable community and society. We believe in the value of a strong education as a means of preparing students for work and life in the remainder of the 21st century.

STRATFORD HIGH SCHOOL BELIEFS

- a safe, positive school climate that embraces diversity is essential to ensure respect and opportunity for each individual
- students should understand the world beyond their community in order to contribute to a global society
- parents and students must share responsibility and work in partnership with the school in order to improve academic performance and to develop lifelong learners
- students should use technology effectively to acquire, process, and deliver information

BUNNELL HIGH SCHOOL and STRATFORD HIGH SCHOOL

LEARNING EXPECTATIONS

All students will...

- use real-world digital and other research tools to access, evaluate and effectively apply information appropriate for authentic tasks. (Academic)
- work independently and collaboratively to solve problems and accomplish goals. (Civic-Social)
- communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. (Academic)
- demonstrate innovation, flexibility and adaptability in thinking patterns, work habits and working/learning conditions. (Academic)
- effectively apply the analysis, synthesis and evaluation processes that enable productive problem solving. (Academic)
- value and demonstrate personal responsibility, character, cultural understanding and ethical behavior. (Civic-Social)
- show competence in all core academic subjects and other fields of interest, including the ability to clearly and effectively communicate content information in multiple formats. (Academic)

**Stratford Public Schools
Pre- Calculus Level 1 Unit # 1**

Unit Name: Review Est. # of Weeks: 2 Synopsis: This unit is a review of required skills. Students will review graphing points and lines. We will also review solving various types of equations.	
STUDENT LEARNING GOALS	
Content-Specific Powered Standards Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.	Interdisciplinary Standards (Technology Integration) Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources. Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests. Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information. Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions. Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management <hr style="border-top: 1px dashed black;"/> Key Vocabulary The Cartesian coordinate system, quadrants, ordered pairs, linear equations, quadratic equations, radical expressions, absolute values, interval notation, slope and y-intercept of a line, slope-intercept form, point-slope form, general form of the equation of a line, vertical lines, horizontal lines, parallel lines, perpendicular lines
21st Century Skills 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.	Enduring Understandings: Students should... 1.1 Understand and describe patterns and functional relationships. a. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions. <i>(extended)</i> 1.2 Represent and analyze quantitative relationships in a variety of ways. a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs. a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations <i>(extended)</i> 1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems. a. Solve problems using a variety of algebraic methods.
Essential Questions <ul style="list-style-type: none"> ➤ What is the purpose of algebra? ➤ Why is the mastery of algebraic skills necessary for proficiency in higher levels of mathematics? ➤ How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools and technologies. 	
Learning Objectives / Grade Level Expectations <i>Students will:</i> <ul style="list-style-type: none"> ➤ Find the distance between two points ➤ Find the midpoint of a line segment 	

- Solve linear equations, quadratic equations, equations containing radical expressions, equations containing absolute values
- Multiply two binomials
- Factor a quadratic polynomial quadratic expression
- Use interval notation to describe an inequality
- Solve linear inequalities and inequalities containing absolute values
- Determine the slope and y-intercept of a line
- Use the point-slope form to write the equation of a line
- Write of the equation of a line in slope-intercept form and the general form of the equation of a line
- Graph a linear equation
- Determine if lines are parallel or perpendicular

Graph vertical and horizontal lines;

ASSESSMENT PLAN

Summative Assessment(s)/Performance Based Assessments including 21st Century Learning
 Quizzes
 Chapter Test

- Formative and Diagnostic Assessment(s)**
1. find the distance between two points
 2. solve linear equations
 3. square a binomial
 4. factor a trinomial
 5. solve quadratic equations
 6. graph a linear equation
 write the equation of a line

LEARNING PLAN COMPONENTS

Textbook: Precalculus Graphing and Data Analysis, Sullivan and Sullivan, Prentice Hall Texas Instruments graphing calculator

Stratford Public Schools
Pre- Calculus Level 1 Unit # 2

Unit Name: Functions Est. # of Weeks: 3	
Synopsis: This unit is a general overview of functions. In this unit, students will learn the vocabulary of functions. Students will also learn how to use functions to solve problems.	
STUDENT LEARNING GOALS	
<p>Content-Specific Powered Standards</p> <p>Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.</p> <p>Geometry and Measurement Shapes and structures can be analyzed, visualized, measured, and transformed using a variety of strategies, tools, and technologies.</p> <hr/> <p>21st Century Skills</p> <ol style="list-style-type: none"> 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior. 	<p>Interdisciplinary Standards (Technology Integration)</p> <p>Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources.</p> <p>Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.</p> <p>Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.</p> <p>Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.</p> <p>Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management</p> <hr style="border-top: 1px dashed black;"/> <p>Key Vocabulary function, independent variable, dependent variable, domain, range, value of a function, increasing and decreasing functions, maximum and minimum values, odd and even functions, average rate of change of a function, piecewise-defined functions, composition of functions</p>
<p>Enduring Understandings: Students should...</p> <p>1.1 Understand and describe patterns and functional relationships.</p> <p>a. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions. <i>(extended)</i></p> <p>1.2 Represent and analyze quantitative relationships in a variety of ways.</p> <p>a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.</p> <p>a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations <i>(extended)</i></p> <p>1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.</p> <p>a. Solve problems using a variety of algebraic methods.</p>	<p>Essential Questions</p> <ul style="list-style-type: none"> ➤ What is a function? ➤ How do functions relate to the real world? ➤ How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools and technologies.

<p>a. Use and extend algebraic concepts to include real and complex numbers, vectors and matrices. <i>(extended)</i></p> <p>3.2 Use spatial reasoning, location and geometric relationships to solve problems.</p> <p>a. Verify geometric relationships using algebra, coordinate geometry and transformations.</p> <p>a. Use a variety of coordinate systems and transformations to solve geometric problems in two- and three- dimensions using appropriate tools and technologies. <i>(extended)</i></p>	
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<p>Learning Objectives / Grade Level Expectations</p> <p><i>Students will:</i></p> <ul style="list-style-type: none"> ➤ Identify a function from a selection of graphs ➤ Use and understand function notation ➤ Identify the dependent and independent variables in a function ➤ Find the value of a function at a point ➤ State the domain and range of a function ➤ Determine where a function is increasing and decreasing ➤ Find the maximum and minimum values of a function ➤ Determine if a function is odd or even ➤ Determine the symmetry of a graph ➤ Determine the average rate of change of a function ➤ Sketch graphs of linear functions, constant functions, identity function, square function, cube function, square root function, reciprocal function, absolute value function, greatest integer function, piecewise-defined functions ➤ Perform operations (addition, subtraction, multiplication, division) on functions ➤ Compose a new function from two given functions 	
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ASSESSMENT PLAN	
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<p>Summative Assessment(s)/Performance Based Assessments including 21st Century Learning</p> <p>Quizzes</p> <p>Chapter Test</p> <p>PBA #1 Cell Phone Service pg 146-147</p>	<p>Formative and Diagnostic Assessment(s)</p> <ol style="list-style-type: none"> 7. find the value of a function 8. find the domain and range of a function 9. read a graph of a functions 10. find the average rate of change of a function 11. find the composition of two functions 12. find the function that represents a given situation
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LEARNING PLAN COMPONENTS	
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<p>Textbook: <u>Precalculus Graphing and Data Analysis</u>, Sullivan and Sullivan, Prentice Hall Texas Instruments graphing calculator</p>
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Stratford Public Schools
Pre-Calculus Level 1 Unit # 3

Unit Name: Quadratic Functions Est. # of Weeks: 2 Synopsis: In this unit, students will study quadratic functions. They will learn about the equations, graphs, and applications of quadratic functions.	
STUDENT LEARNING GOALS	
<p>Content-Specific Powered Standards</p> <p>Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.</p> <p>Numerical and Proportional Reasoning Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.</p> <p>Geometry and Measurement Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.</p> <p>Working with Data: Probability and Statistics Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies</p> <hr/> <p>21st Century Skills</p> <ol style="list-style-type: none"> 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior. 	<p>Interdisciplinary Standards (Technology Integration)</p> <p>Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources.</p> <p>Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.</p> <p>Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.</p> <p>Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.</p> <p>Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management</p> <hr style="border-top: 1px dashed black;"/> <p>Key Vocabulary quadratic function, parabola, vertex of a parabola, quadratic formula, completing the square, revenue, demand, projectile motion, imaginary numbers, complex numbers system, standard form of a complex number</p>
<p>Enduring Understandings: Students should...</p> <p>1.1 Understand and describe patterns and functional relationships. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions (<i>extended</i>)</p> <p>1.2 Represent and analyze quantitative</p>	<p>Essential Questions</p> <ul style="list-style-type: none"> ➤ How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ➤ How can an abstract concept such as imaginary and complex numbers be of practical use? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools, and technologies.

<p>relationships in a variety of ways.</p> <p>a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.</p> <p>a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations. <i>(extended)</i></p> <p>1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.</p> <p>a. Solve problems using a variety of algebraic methods.</p> <p>a. Use and extend algebraic concepts to include real and complex numbers, vectors and matrices. <i>(extended)</i></p> <p>2.1 Understand that a variety of numerical representations can be used to describe quantitative relationships.</p> <p>a. Extend the understanding of number to include the set of complex numbers. <i>(extended)</i></p> <p>3.2 Use spatial reasoning, location and geometric relationships to solve problems.</p> <p>a. Use a variety of coordinate systems and transformations to solve geometric problems in two- and three- dimensions using appropriate tools and technologies. <i>(extended)</i></p> <p>4.1 Collect, organize and display data using appropriate statistical and graphical methods.</p> <p>a. Create the appropriate visual or graphical representation of real data.</p> <p>a. Model real data graphically using appropriate tools, technology and strategies. <i>(extended)</i></p>	<ul style="list-style-type: none"> ➤ How can shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies ➤ How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?
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<p>Learning Objectives / Grade Level Expectations</p>	
<p><i>Students will:</i></p>	
<ul style="list-style-type: none"> ➤ Identify a quadratic function from a linear function ➤ Finding the vertex of a parabola and the intercepts of a parabola ➤ Graph a quadratic function labeling the vertex and the intercepts ➤ State the domain and range of a quadratic function ➤ Solve a quadratic equation by factoring ➤ Solve a quadratic equation by using the quadratic formula ➤ Solve a quadratic equation graphically ➤ Determine the maximum and minimum values by using a graphing calculator ➤ Master the technique of completing the square ➤ Determine a revenue equation and find the price that will yield the maximum revenue ➤ Determine an equation for area and find the dimensions that will yield the maximum area ➤ Determine the height of a projectile at a given time ➤ Add, subtract multiply and divide complex numbers <p>Simplify powers of i</p>	

ASSESSMENT PLAN

<p>Summative Assessment(s)/Performance Based Assessments including 21st Century Learning</p> <p>Quizzes</p> <p>Chapter Test</p>	<p>Formative and Diagnostic Assessment(s)</p> <ol style="list-style-type: none"> 1. find the vertex of a parabola 2. find the x intercepts of a parabola by factoring 3. graph a quadratic function 4. completing the square 5. write the equation of a revenue function 6. operations of complex numbers
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LEARNING PLAN COMPONENTS

Textbook: Precalculus Graphing and Data Analysis, Sullivan and Sullivan, Prentice Hall
 Texas Instruments graphing calculator

Stratford Public Schools
Pre-Calculus Level 1 Unit # 4

Unit Name: Polynomial Functions Est. # of Weeks: 3 Synopsis: In this unit, students will study polynomial functions. They will learn about the equations, graphs and applications of polynomial functions.	
Interdisciplinary Standards (Technology Integration)	
Content-Specific Powered Standards Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.	Interdisciplinary Standards (Technology Integration) Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources. Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests. Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information. Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions. Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management
21st Century Skills 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.	<hr style="border-top: 1px dashed black;"/> Key Vocabulary polynomial function, degree of a polynomial function, zeros of a polynomial, multiplicity of the zeros of a polynomial, turning point, end behavior The Remainder Theorem, the Factor Theorem, intermediate value theorem
Enduring Understandings: Students should... 1.1 Understand and describe patterns and functional relationships. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions. <i>(extended)</i> 1.2 Represent and analyze quantitative relationships in a variety of ways. a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs. a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations <i>(extended)</i> 1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems. a. Solve problems using a variety of algebraic methods. a. Use and extend algebraic concepts to include real and complex numbers, vectors and matrices. <i>(extended)</i> 4.1 Collect, organize and display data using appropriate statistical and graphical methods. a. Create the appropriate visual or graphical representation of real data.	Essential Questions <ul style="list-style-type: none"> ➤ How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ➤ What is the behavior of a polynomial function? ➤ It is possible to determine if the polynomial function is tangent to the x-axis? ➤ What is the relationship between the roots and the degree of a polynomial function? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools and technologies. ➤ How can shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies ➤ How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

a. Model real data graphically using appropriate tools, technology and strategies. <i>(extended)</i>	
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Learning Objectives / Grade Level Expectations
Students will:

- Identify a polynomial function from other types of functions
- State the degree of a polynomial function and determine how many zeros are possible
- State the multiplicity of the zeros of a polynomial and determine if the function is tangent to the x-axis
- Find the zeros of a polynomial by factoring and b using a graphing calculator
- Find a polynomial from its zeros
- Use a calculator to graph polynomial functions
- Use a calculator to determine the coordinates of the turning points
- Determine the end behavior of a polynomial function
- Use a calculator to find zeros of a polynomial function
- Have familiarity with the intermediate value theorem
- Solve a polynomial inequality by substitution
- Solve a polynomial inequality by graphing
- Determine the equation of the volume of an open box and find the dimensions that will yield a maximum volume

ASSESSMENT PLAN

<p>Summative Assessment(s)/Performance Based Assessments including 21st Century Learning Quizzes Chapter Test</p>	<p>Formative and Diagnostic Assessment(s)</p> <ol style="list-style-type: none"> 7. determine the multiplicity and tangency of a polynomial function 8. find the zeros by factoring 9. find a polynomial from its zeros 10. find the coordinates of the turning points 11. solve a polynomial inequality 12. determine the equation of the volume of an open box
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LEARNING PLAN COMPONENTS

Textbook: Precalculus Graphing and Data Analysis, Sullivan and Sullivan, Prentice Hall
 Texas Instruments graphing calculator

Stratford Public Schools
Pre-Calculus Level 1 Unit # 5

Unit Name: Rational Functions Est. # of Weeks: 3	
Synopsis: In this unit, students will study rational functions. They will be introduced to the concept of limits.	
STUDENT LEARNING GOALS	
<p>Content-Specific Powered Standards Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.</p> <hr/> <p>21st Century Skills</p> <ol style="list-style-type: none"> 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior. 	<p>Interdisciplinary Standards (Technology Integration)</p> <p>Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources.</p> <p>Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.</p> <p>Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.</p> <p>Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.</p> <p>Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management</p> <hr style="border-top: 1px dashed black;"/> <p>Key Vocabulary rational function vertical, horizontal and oblique asymptotes, limit of a function, continuity, essential discontinuities, removable discontinuities</p>
<p>Enduring Understandings: Students should...</p> <p>1.1 Understand and describe patterns and functional relationships. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions. <i>(extended)</i></p> <p>1.2 Represent and analyze quantitative relationships in a variety of ways.</p> <ol style="list-style-type: none"> a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs. a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations <i>(extended)</i> <p>1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.</p> <ol style="list-style-type: none"> a. Solve problems using a variety of algebraic methods. b. Use and extend algebraic concepts to include real and complex numbers, vectors and matrices. <i>(extended)</i> 	<p>Essential Questions</p> <ul style="list-style-type: none"> ➤ How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ➤ What is a rational function? ➤ How can one determine the continuity of a rational function? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools and technologies.

Learning Objectives / Grade Level Expectations*Students will:*

- Identify a rational function from other types of functions
- State the domain and range of rational functions
- Determine if a rational function has vertical, horizontal and oblique asymptotes
- Determine the x and y intercepts
- Find the limit of a function as x approaches infinity
- Find the limit of a function as x approaches a given value of x
- Determine the discontinuities of a function
- Determine if a discontinuity is essential discontinuities or removable
- Be able to sketch a graph by using a seven step process of analyzing rational functions
- Solving rational inequalities by graphing
- Solving rational inequalities by factoring and substitution

ASSESSMENT PLAN**Summative Assessment(s)/Performance Based Assessments including 21st Century Learning**

Quizzes
Chapter Test

Formative and Diagnostic Assessment(s)

13. domain and range of rational functions
14. find the limit as x approaches infinity
15. find the x and y intercepts
- 16.** sketch a graph of a rational function without a calculator
- 17.** solve a rational inequality

LEARNING PLAN COMPONENTS

Textbook: Precalculus Graphing and Data Analysis, Sullivan and Sullivan, Prentice Hall
Texas Instruments graphing calculator

**Stratford Public Schools
Pre-Calculus Level 1 Unit # 6**

Unit Name: Exponential and Logarithmic Functions		Est. # of Weeks: 4
Synopsis: Students will investigate the properties of logarithmic and exponential functions. Students will learn several applications of logarithmic and exponential functions.		
STUDENT LEARNING GOALS		
<p>Content-Specific Powered Standards Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies. Working with Data: Probability and Statistics Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies</p>	<p>Interdisciplinary Standards (Technology Integration)</p> <p>Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources.</p> <p>Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.</p> <p>Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.</p>	
	<p>Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.</p> <p>Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management</p> <hr/> <p>Key Vocabulary one-to-one functions, the horizontal line test, inverse function, verifying the inverse of a function, exponential function, the number e, logarithm, base of a logarithmic expression, compound interest formula, continuously compounded interest, uninhibited growth and decay, Newton's Law of cooling formula, logistic growth</p>	
<p>21st Century Skills</p> <ol style="list-style-type: none"> 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior. 	<p>Enduring Understandings: Students should...</p> <p>1.1 Understand and describe patterns and functional relationships. a. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions. <i>(extended)</i></p> <p>1.2 Represent and analyze quantitative relationships in a variety of ways. a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs. a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations <i>(extended)</i></p> <p>1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems. a. Solve problems using a variety of algebraic methods.</p>	
		<p>Essential Questions</p> <ul style="list-style-type: none"> ➤ What types of naturally occurring events follow exponential or logarithmic behavior? ➤ How do banks compound interest? ➤ How is the age of artifact determined? ➤ How long does it take for a pie to cool? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools and technologies. ➤ How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

b. Use and extend algebraic concepts to include real and complex <i>(extended)</i> 4.1 Collect, organize and display data using appropriate statistical and graphical methods. a. Create the appropriate visual or graphical representation of real data. a. Model real data graphically using appropriate tools, technology, and strategies. <i>(extended)</i>	
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Learning Objectives / Grade Level Expectations <i>Students will:</i> <ul style="list-style-type: none"> ➤ Determine if a functions is one-to-one ➤ Find the inverse of a function, ➤ Verify that a function is the inverse of a given function ➤ Determine the domain and range of the inverse function ➤ apply the rules for exponents to simplify expressions ➤ Identify an exponential function ➤ Solve exponential equations ➤ Graph exponential functions ➤ Write exponential expressions as logarithmic expressions ➤ Write logarithmic expressions as exponential expressions ➤ Evaluate logarithmic expressions ➤ Solve logarithmic equations ➤ Use logarithms solve exponential equations ➤ Graph logarithmic functions ➤ Use the properties of logarithms to simplify logarithmic expressions ➤ Change of base of a logarithmic expression ➤ Graph logarithmic functions using a calculator and the change of base formula ➤ Solve compound interest problems ➤ Solve uninhibited growth and decay problems ➤ Solve cooling problems using Newton’s Law of cooling formula 	
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ASSESSMENT PLAN

Summative Assessment(s)/Performance Based Assessments including 21st Century Learning Quizzes Chapter Test PBA #3 to be determined (Compound Interest/ Loan Payment or Inflation)	Formative and Diagnostic Assessment(s) 18. find the inverse of a function 19. simplify exponential expressions 20. graph an exponential equation 21. solve and exponential equation 22. Write exponential expressions as logarithmic expressions 23. solve logarithmic equations
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LEARNING PLAN COMPONENTS

Textbook: <u>Precalculus Graphing and Data Analysis</u> , Sullivan and Sullivan, Prentice Hall Texas Instruments graphing calculator

Stratford Public Schools
Pre- Calculus Level 1 Unit # 7

Unit Name: Trigonometric Functions Est. # of Weeks: 4 Synopsis: Students will study the relationships of circular functions. Students will learn about the relationships between angular and linear velocities. They will learn the six trigonometric functions. They will study the graphs of the sine and cosine functions and apply the graphs to solve periodic applications.	
STUDENT LEARNING GOALS	
<p>Content-Specific Powered Standards</p> <p>Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.</p> <p>Geometry and Measurement Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.</p> <p>Working with Data: Probability and Statistics Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies</p> <hr/> <p>21st Century Skills</p> <ol style="list-style-type: none"> 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior. 	<p>Interdisciplinary Standards (Technology Integration)</p> <p>Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources.</p> <p>Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.</p> <p>Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.</p> <p>Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.</p> <p>Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management</p> <hr style="border-top: 1px dashed black;"/> <p>Key Vocabulary standard position of an angle, degree measure, minutes, seconds, radian measure, arc length, linear velocity, angular velocity, unit circle, the wrapping function, special right triangles, sine, cosine, tangent, cotangent, secant, cosecant, amplitude, period, phase shift, sinusoidal axis</p>
<p>Enduring Understandings: Students should...</p> <p>1.1 Understand and describe patterns and functional relationships. a. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions. <i>(extended)</i></p> <p>1.2 Represent and analyze quantitative relationships in a variety of ways. a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.</p>	<p>Essential Questions</p> <ul style="list-style-type: none"> ➤ What are the trigonometric functions and how are they used today? ➤ How are trigonometric functions used in civil engineering, acoustics, and wireless communications? ➤ How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools, and technologies. ➤ How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

<p>a. Relate the behavior of functions and relations to specific parameters and determine functions to model real-world situations <i>(extended)</i></p> <p>1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.</p> <p>a. Solve problems using a variety of algebraic methods. a. Use and extend algebraic concepts to include real and complex numbers, vectors and matrices. <i>(extended)</i></p> <p>3.2 Use spatial reasoning, location and geometric relationships to solve problems.</p> <p>a. Use a variety of coordinate systems and transformations to solve geometric problems in two- and three- dimensions using appropriate tools and technologies. <i>(extended)</i></p> <p>4.1 Collect, organize and display data using appropriate statistical and graphical methods.</p> <p>a. Create the appropriate visual or graphical representation of real data. a. Model real data graphically using appropriate tools, technology, and strategies. <i>(extended)</i></p>	
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<p>Learning Objectives / Grade Level Expectations <i>Students will:</i></p> <ul style="list-style-type: none"> ➤ Change degree measure to radian measure ➤ Change radian measure to degree measure and radian measure ➤ Change angular velocity to linear velocity ➤ Change linear velocity to angular velocity ➤ Derive the relationship of the sides of a 45-45-90 triangle ➤ Derive the relationship of the sides of a the 30- 60-90 triangle ➤ Draw angle in standard position ➤ Apply the definitions of the sine, cosine, tangent, cotangent, secant, and cosecant functions ➤ Find the values of five trigonometric functions when given one trigonometric value ➤ Find the values of the six trigonometric functions when given a point through which the angle passes ➤ Using a calculator to approximate sine, cosine, tangent, cotangent, secant, and cosecant values ➤ Sketch the graphs of the sine and cosine functions ➤ State the domain, range, amplitude, period, phase shift and sinusoidal axis of the sine and cosine functions ➤ Model real-world situations and make generalizations about mathematical relationships using sine and cosine functions 	
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ASSESSMENT PLAN

<p>Summative Assessment(s)/Performance Based Assessments including 21st Century Learning Quizzes Chapter Test</p>	<p>Formative and Diagnostic Assessment(s)</p> <ul style="list-style-type: none"> 24. draw and angle in standard position 25. change degree measure to radian measure 26. change angular velocity to linear velocity 27. given the value one a trigonometric function, find the other five values 28. sketch a graph of a sine or cosine function
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LEARNING PLAN COMPONENTS

Textbook: Precalculus Graphing and Data Analysis, Sullivan and Sullivan, Prentice Hall
 Texas Instruments graphing calculator

Stratford Public Schools
Pre-Calculus Level 1 Unit # 8

Unit Name: Properties of Trigonometric Functions Est. # of Weeks: 3 Synopsis: Students will study and prove various identities of trigonometric functions. They will study the inverse trigonometric functions and their principal branches. They will use inverses to solve trigonometric equations.	
STUDENT LEARNING GOALS	
<p>Content-Specific Powered Standards</p> <p>Algebraic Reasoning: Patterns And Functions Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.</p> <p>Geometry and Measurement Shapes and structures can be analyzed, visualized, measured, and transformed using a variety of strategies, tools and technologies.</p> <hr/> <p>21st Century Skills</p> <ol style="list-style-type: none"> 1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks. 2. Work independently and collaboratively to solve problems and accomplish goals. 3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. 4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions. 5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving. 6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior. 	<p>Interdisciplinary Standards (Technology Integration)</p> <p>Standard 1: Information Strategies Students determine their need for information and apply strategies to select, locate, and access information resources.</p> <p>Standard 2: Information Use Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.</p> <p>Standard 3: Information and Technology Application Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.</p> <p>Standard 4: Literacy and Literary Appreciation Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.</p> <p>Standard 5: Personal Management Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management</p> <hr style="border-top: 1px dashed black;"/> <p>Key Vocabulary identity, inverse trigonometric values, principal, linear trigonometric equations, quadratic trigonometric equations</p>
<p>Enduring Understandings: Students should...</p> <p>1.1 Understand and describe patterns and functional relationships.</p> <p>a. Model real-world situations and make generalizations about mathematical relationships using a variety of patterns and functions. <i>(extended)</i></p> <p>1.2 Represent and analyze quantitative relationships in a variety of ways.</p> <p>a. Represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.</p> <p>1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.</p> <p>a. Solve problems using a variety of algebraic methods.</p> <p>3.1 Use properties and characteristics of two- and three-dimensional shapes and geometric theorems</p>	<p>Essential Questions</p> <ul style="list-style-type: none"> ➤ What is an identity? ➤ How can we show that a math relationship is always true? ➤ Why do inverse trigonometric functions have principal branches? ➤ How can patterns and functional relationships be represented and analyzed using a variety of strategies, tools, and technologies.

<p>to describe relationships, communicate ideas and solve problems.</p> <p>a. Develop and evaluate mathematical arguments using reasoning and proof.</p> <p>a. Use methods of deductive and inductive reasoning to make, test and validate geometric conjectures. (extended)</p> <p>3.2 Use spatial reasoning, location and geometric relationships to solve problems.</p> <p>a. Use methods of deductive and inductive reasoning to make, test and validate geometric conjectures (extended)</p>	
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<p>Learning Objectives / Grade Level Expectations</p> <p><i>Students will:</i></p> <ul style="list-style-type: none"> ➤ Learn and prove the following trigonometric identities: quotient identities, reciprocal identities, Pythagorean identities, odd-even identities, sum and difference identities, double angle identities, half angle formulas ➤ Use the identities to prove other relationships ➤ Use identities to find the exact values of other angles ➤ Find inverse trigonometric values of a given quantity ➤ Know the principal branches of the six inverse trigonometric functions ➤ Use a calculator to approximate inverse trigonometric values ➤ Solve linear trigonometric equations ➤ Solve trigonometric equations with a linear argument ➤ Solve quadratic trigonometric equations ➤ Solve linear trigonometric equations by using identities ➤ Solve linear trigonometric equations by using a graphing utility 	
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ASSESSMENT PLAN

<p>Summative Assessment(s)/Performance Based Assessments including 21st Century Learning</p> <p>Quizzes</p> <p>Chapter Test</p> <p>PBA #4: Sinusoidal models of real world situations. (Ex: Ferris Wheel, Paddle Wheel, Daylight Hours, etc.)</p>	<p>Formative and Diagnostic Assessment(s)</p> <ol style="list-style-type: none"> 29. proof an identity using a previously proven identity 30. find inverse trigonometric value of a given number 31. between three choices, find the inverse trigonometric value within the principal branch 32. use a calculator to approximate an inverse trigonometric value 33. solve a linear trigonometric equation 34. solve a trigonometric equation with a linear argument 35. solve a quadratic trigonometric equation
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LEARNING PLAN COMPONENTS

<p>Textbook: <u>Precalculus Graphing and Data Analysis</u>, Sullivan and Sullivan, Prentice Hall</p> <p>Texas Instruments graphing calculator</p>
