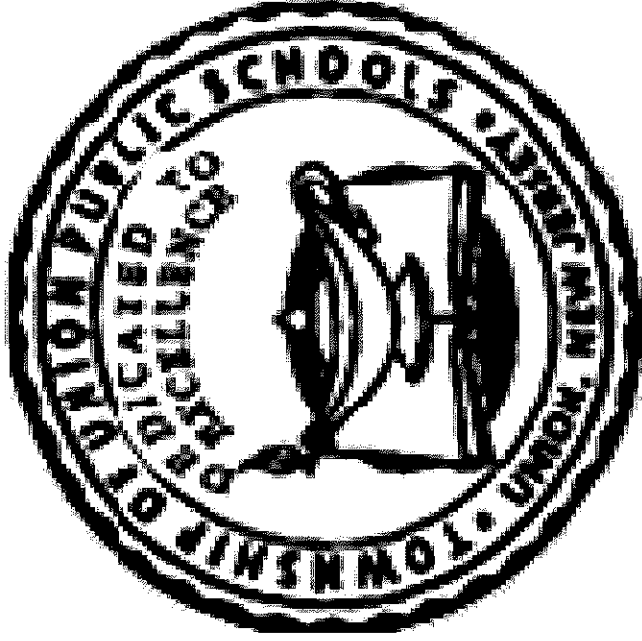
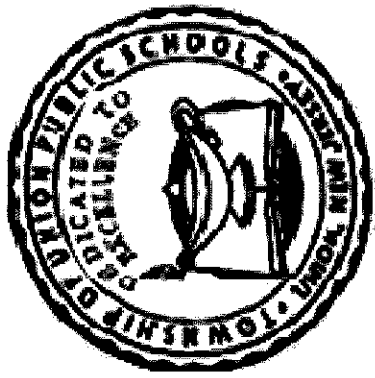


TOWNSHIP OF UNION PUBLIC SCHOOLS



College Algebra  
**Curriculum Guide 2015**

Curriculum Guide Approved June 2015



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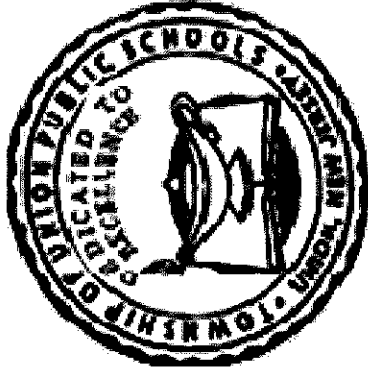
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**TOWNSHIP OF UNION PUBLIC SCHOOLS**  
**Administration**

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**Assistant Superintendent ..... Dr. Noreen Lishak**

**Director of Curriculum K-12 ..... Dr. Noreen Lishak**

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## DEPARTMENT SUPERVISORS

Language Arts/Social Studies 3-5 .....	Mr. Robert Ghiretti
Mathematics/Science 3-5 .....	Ms. Terri Mathews
Elementary Pre K-2 (All Subjects) .....	Ms. Maureen Corbett
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Language Arts/Library Services 7-12 .....	Ms. Mary Malyska
Math 7-12.....	Mr. Jason Mauriello
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**Curriculum Committee**

**Roseanne Borges**

**Ines Jaramillo**

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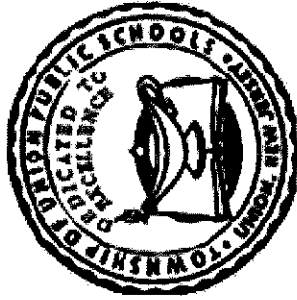
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## **District Mission Statement**

The Township of Union Board of Education believes that every child is entitled to an education, designed to meet his or her individual needs, in an environment that is conducive to learning. State standards, federal and state mandates, and local goals and objectives, along with community input, must be reviewed and evaluated on a regular basis to ensure that an atmosphere of learning is both encouraged and implemented. Furthermore, any disruption to or interference with a healthy and safe educational environment must be addressed, corrected, or, when necessary, removed, in order for the district to maintain the appropriate educational setting.

## **District Philosophy Statement**

The Township of Union Public School District, as a societal agency, reflects democratic ideals and concepts through its educational practices. It is the belief of the Board of Education that a primary function of the Township of Union Public School System is the formulation of a learning climate conducive to the needs of all students in general, providing therein for individual differences. The school operates as a partner with the home and community.



## Statement of District Goals

- ❖ Develop reading, writing, speaking, listening, and mathematical skills.
- ❖ Develop a pride in work and a feeling of self-worth, self-reliance, and self discipline.
- ❖ Acquire and use the skills and habits involved in critical and constructive thinking.
- ❖ Develop a code of behavior based on moral and ethical principals.
- ❖ To be able to work with others cooperatively.
- ❖ Acquire a knowledge and appreciation of the historical record of human achievement and failures and current societal issues.
- ❖ Acquire a knowledge and understanding of the physical and biological sciences.
- ❖ Efficient and effective participation in economic life and the development of skills to enter a specific field of work.
- ❖ Appreciate and understand literature, art, music, and other cultural activities.
- ❖ Develop an understanding of the historical and cultural heritage.
- ❖ Develop a concern for the proper use and/or preservation of natural resources.
- ❖ Develop basic skills in sports and other forms of recreation.



## **Course Description**

This course is designed to reinforce the topics covered in the Algebra II course. It consists of a structured scope and sequence, introducing, reinforcing and extending topics identified by the Common Core State Standards. This course will prepare students for college level courses in mathematics. The course is divided into six units covering the traditional skills and concepts required for preparation for more advanced courses in mathematics.

Students will model and solve algebraic problems that involve the study of polynomial, quadratic, radical, rational, exponential and logarithmic functions. Students will model and solve basic trigonometry, trigonometric identities, equations and application problems.

Each of the six units will include the use of group explorations, scientific and graphing calculators to study real world problems solving techniques and presentation strategies.

## **Recommended Textbooks**

## Course Proficiencies

### EACH STUDENT WILL BE ABLE TO:

- Simplify, graph, solve and apply exponential and radical functions.
- Simplify, graph, solve and apply logarithmic functions.
- Simplify, graph, solve and apply rational equations.
- Simplify and apply composite functions.
- Graph and solve functions and extract information from multiple forms.
- Perform all operations with polynomials, and to factor polynomials.
- To determine if a function has an inverse, and if it has one, find its equation.
- Use algebraic expressions as models of real-life situations.
- Use all methods of factoring polynomials.
- Examine and solve quadratic models involving objects, parabolic shaped regions and quantities related to time
- Find values of trigonometric functions for acute and general angles.
- Find exact and approximate values for the six trigonometric functions.
- Verify trigonometric identities, simplify/evaluate expressions and solve trigonometric equations.
- Identify graphs of the basic trigonometric functions
- Understand and apply trigonometric functions to solve real-life problems about measurement.
- Choose the appropriate trigonometric function to find missing parts of right and oblique triangles.
- Use identities to find values of trigonometric functions and to solve trigonometric equations.

## Curriculum Units

### Unit 1: Exponents and Polynomial Functions

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Use rules of exponents	HSN.RN.A-1
2	Recognize exponential functions	HSF-LE-A-1.c
3	Operations with polynomials	HAS.APR.A-1
4	Graph polynomial functions	HSF-IF.C.7-c
5	Finding composite functions	HSF-BF-B-4.b

***Bold type indicates grade level fluency requirements. (Identified by PARCC Model Content Frameworks).***

#### **Selected Opportunities for Connection to Mathematical Practices**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*All of the content presented at this grade level has connections to the standards for mathematical practices.*

***Bold type identifies possible starting points for connections to the SLOs in this unit.***

<b>Common Core State Standards</b>	
<b>Code #</b>	
HSN.RN.A-1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^1$ to hold, so $(5^{1/3})^3$ must equal 5.
HSF-LE-A-1.c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
HAS.APR.A-1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
HSF-IF.C.7-c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Verify by composition that one function is the inverse of another.
HSF-BF-B-4.b	

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<b>Assessments</b>	
<b>CCSS #</b>	
HSN.RN.A-1	Simplify the expression $\frac{(2x^2)^{3/2}}{2^{1/2}x^{1/4}}$
HSF-LE-A-1.c	The approximate number of fruit flies in an experimental population after $t$ hours is given by the function: $Q(t) = 20e^{0.03t}$ , where $t \geq 0$ a. Find the initial number of fruit flies in the population. b. How large is the population of fruit flies after 72 hours? c. Graph $Q$
HAS.APR.A-	A candy factory needs a box that has a volume of 30 cubic inches. The width should be 2 inches less than the height

1	and the length should be 5 inches greater than the height. What should the dimensions of the box be? One zero of $f(x) = x^3 - 2x^2 - 9x + 18$ is $x = 2$ . Find the other zeroes of the function. Use synthetic division and factoring. Verify the zeroes by graphing the function.
HSF-IF.C.7-c	
HSF-BF-B-4.b	Verify that the function $f(x) = \frac{x-5}{2}$ and $g(x) = 2x + 5$ are inverse functions of each other numerically. Use $f(g(x)) = x$ and $g(f(x)) = x$

## Unit 2 Factoring and Quadratics

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	All methods of factoring polynomials	HAS.SSE.A-2
2	Solve polynomial equations by factoring	HAS.REI.B.4-b
3	Solve quadratic equations by the following methods: zero-product property, square root property, completing the square, quadratic formula and graphing.	HAS.REI.B.4-b
4	To use quadratic equations to solve real-life problems	HSF.BF.A.1
5	Solve quadratic inequalities algebraically	HAS.CED.A.1

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- All of the content presented at this grade level has connections to the standards for mathematical practices.*
- Bold type identifies possible starting points for connections to the SLOs in this unit.***

<b>Common Core State Standards</b>	
HAS.SSE.A-2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$ , thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2) = (x + y)(x - y)(x^2 + y^2)$
HAS.REI.B.4-b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$ .
HSF.BF.A.1	Write a function that describes a relationship between two quantities.
HAS.CED.A.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

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<b>Assessments</b>	
HAS.SSE.A-2	Write a paragraph explaining why $(x + y)^2 \neq x^2 + y^2$
HAS.REI.B.4-b	Given the equation $6x^2 + 7x = 3$ use three different methods of solving quadratic equations to find the solutions. Compare and discuss the methods used.
HSF.BF.A.1	Maurice Daniels wants to buy a rug for a room that is 12 ft wide and 15 ft long. He wants to leave a uniform strip of floor around the rug. He can afford to buy 108 square feet of carpeting. What dimensions should the rug have?
HAS.CED.A.1	If a projectile is launched from ground level with an initial velocity of 96 ft/sec, its height $s$ in feet $t$ seconds after

launching is given by the following equation:  $s = -16t^2 + 96t$ . When will the projectile be greater than 80 feet above ground level?

## Unit 3 Rational Expressions and Functions

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Simplify and perform operations with rational expressions	HAS.APR.D.7
2	Simplify complex fractions	HAS.APR.D.6
3	Determine domain of rational expressions/equations	HSF.IF.B.5
4	Solve rational equations and apply to real-life settings	HAS.CED.A.1
5	Graph rational equations	HAS.REI.D.11

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<b>Common Core State Standards</b>	
<b>Code #</b>	
HAS.APR.D.7	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
HAS.APR.D.6	Rewrite simple rational expressions in different forms
HSF.IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
HAS.CED.A.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
HAS.REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

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<b>Assessments</b>	
<b>CCSS #</b>	
HAS.APR.D.7	Write the rational expression in lowest terms: $\frac{a^2 - a - 6}{a^2 + 5a + 6}$
HAS.APR.D.6	Simplify: $\frac{2y+1}{3y-2} \cdot \frac{y}{y}$

HSF.IF.B.5	Graph and determine the domain: $f(x) = \frac{1}{x}$
HAS.CED.A.1	Letitia and Kareem are working on a neighborhood cleanup. Kareem can clean up all the trash in the area in 7 hours, while Letitia can do the same job in 5 hours. How long will it take them if they work together?
HAS.REI.D.11	Graph: $g(x) = \frac{-2}{x-3}$ and determine the asymptotes, domain and range

## Unit 4 Roots and Radicals

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Find the n-th root of an expression	HSN.RN.A.2
2	Convert radicals to rational exponents and vice versa	HSN.RN.A.1
3	Use rules of exponents with rational exponents to simplify rational expressions	HSN.RN.A-1
4	Operations with radicals (including use of the conjugate to rationalize the denominator)	HSN.RN.A.2
5	Solve radical/rational exponential equations	HAS.REI.A.2

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Code #	Common Core State Standards
HSN.RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
HSN.RN.A.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
HAS.REI.A.2	

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CCSS #	Assessments
HSN.RN.A.2	Simplify: $\sqrt[3]{-81x^5y^4}$
HSN.RN.A.1	Rewrite in rational form: $\sqrt{x^3}$ . Rewrite in radical form: $(2y)^{3/4}$
HAS.REI.A.2	Simplify: $\frac{2}{\sqrt{2}+5}$
HAS.REI.A.2	Solve: $\sqrt{9-x} = x + 3$ ; Solve $(2w - 1)^{2/3} - w^{1/3} = 0$

## Unit 5 Inverse, Exponential and Logarithmic Functions

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	One-to-one functions	HSF-IF-A.1
2	Find the equation of the inverse and graph the inverse	HSF-BF-B.4
3	Define, graph and apply exponential functions	HSF-LE-A.1
4	Define, graph and apply logarithmic functions	HSF-IF-C.7.e
5	Use properties of logarithms	HSF-BF-B.5
6	Solve and apply exponential and logarithmic equations	HSF-LE-A.4

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Code #	Common Core State Standards
HSF-IF-A.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .
HSF-BF-B.4	Find inverse functions. Solve an equation of the form $f(x) = c$ for a simple function $f$ that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$ . Verify by composition that one function is the inverse of another. Read values of an inverse function from a graph or a table, given that the function has an inverse. Produce an invertible function from a non-invertible function by restricting the domain.
HSF-IF-C.7.e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
HSF-BF-B.5	Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
HSF-LE-A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
HSF-LE-A.4	For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where $a$ , $c$ , and $d$ are numbers and the base $b$ is 2, 10, or $e$ ; evaluate the logarithm using technology.

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CCSS #	Assessments
HSF-IF-A.1	Is the function $f(x) = \sqrt{x} + 1$ one-to-one? Find the solution graphically and algebraically.

HSF-BF-B.4	Verify that the functions $f(x) = 2x^3 - 1$ and $g(x) = \sqrt[3]{\frac{x+1}{2}}$ are inverses of each other, both graphically and algebraically.
HSF-LE-A.1	There are three options for investing \$500. The first earns 7% compounded annually, the second earns 7% compounded quarterly and the third earns 7% compounded continuously. Find the equations that model the growth of each investment and use a graph to determine which investment yields the highest return after 20 years. What are the differences in earnings among the three investments?
HSF-IF-C.7.e	Graph: $f(x) = \log_2 x$ . Determine the domain, range and asymptote(s).
HSF-BF-B.5	Use the properties of logarithms to rewrite as a single logarithm: $3\log_p x + \frac{1}{2}\log_p y - \frac{3}{2}\log_p z - 3\log_p a$
HSF-LE-A.4	Kurt wants to buy a \$30,000 car. He has saved \$27,000. Find the number of years (to the nearest tenth) it will take for his \$27,000 to grow to \$30,000 at 4% interest compounded quarterly.

## Unit 6 Trigonometry

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS
1	Angles and the Unit Circle	HSF.TF.A.3
2	Degree and Radian Measure	HSF.TF.A.1
3	Trigonometric Functions and Trigonometric Identities	HSF.TF.C

<b>4</b>	Solving trigonometric equations using inverses and identities	HSF.TF.B.7
<b>5</b>	Solving a right triangle and applications	HSG.SRT.C

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<b>Code #</b>	<b>Common Core State Standards</b>
HSF.TF.A.3	Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$ , $\pi/4$ and $\pi/6$ , and use the unit circle to express the values of sine, cosine, and tangent for $x$ , $\pi + x$ , and $2\pi - x$ in terms of their values for $x$ , where $x$ is any real number.
HSF.TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
HSF.TF.C	Prove and apply trigonometric identities.
HSF.TF.B.7	Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using

	technology, and interpret them in terms of the context. High School right triangles and Trigonometry; To solve problems involving right triangles.
HSG.SRT.C	

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CCSS #	Assessments
HSG-IF-A.1	Find the least positive coterminal angle of $690^\circ$ and graph the angle.
HSG.TF.A.1	Convert $\frac{-3\pi}{4}$ radians to degrees; Convert $245^\circ$ to radian measure.
HSG.TF.C	Simplify: $\cos\theta + \sin\theta \tan\theta$
HSG.TF.B.7	$\cos x = \frac{\sqrt{3}}{2}$ , find the value of $x$
HSG.SRT.C	Solve the right triangle, given: $B = 46.2^\circ$ , $C = 90^\circ$ , and $c = 29.7\text{m}$ .



## **Pacing Guide – Course**

Unit 1: 15 Days  
Unit 2: 30 Days  
Unit 3: 15 Days  
Unit 4: 15 Days  
Unit 5: 30 Days  
Unit 6: 45 Days

Allowances given for additional review days, if necessary, and assessments.