NJ-CCSS AREA: MATHEMATICS

North Brunswick Township Public Schools

Honors Algebra II

Acknowledgements

Amanda Perry, Mathematics Teacher

Diane Galella, Supervisor of Mathematics

Date: New_____

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Board Adoption_____

New Jersey - Common Core State Standards for Mathematics

Unit Prerequisite Material: Fundamental Concepts of Algebra 1 **Grade: 10** **Date: April 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-SSE Seeing Structure in Expressions **A-APR** Arithmetic with Polynomials and Rational Expressions • Why is it important to simplify expressions? • Why is it important to use order of operations?	**A-SSE.1a Interpret the structure of expressions.** Interpret parts of an expression, such as terms, factors, and coefficients. **A-SSE.1b Interpret the structure of expressions.** Interpret complicated expressions by viewing one or more of their parts as a single entity. **A-SSE.3a Write expressions in equivalent forms to solve problems.** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Factor a quadratic expression to reveal the zeros of the function it defines. **A-APR.1 Perform arithmetic operations on polynomials.** 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. **SMP.1** Make sense of problems and persevere in solving them. **SMP.4** Model with mathematics.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ P.1: Evaluate and simplify algebraic expressions. Recognize subsets and identify properties of real numbers. Use inequality symbols. Evaluate absolute value and use it to express distance. **OBJ P.2**: Use the product, quotient, zero-exponent, negative-exponent, and power rules. Find the power of a product and quotient. Simplify exponential expressions. Use scientific notation.	***Summer Assignment (covers P.1 – P.5)*** Review of Summer Assignment **Materials/Technology/Resources:** Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator	**Formative:** • In class practice problems • Board work • Do Now prompts • Summer Assignment **Summative:** • Test P.1 – P.5	4 Days

OBJ P.3: Evaluate and simplify square roots. Add and subtract square roots. Rationalize denominators. Under-stand and use rational exponents. **OBJ P.4**: Add, subtract, and multiply polynomials. Perform operations with polynomials in several variables. **OBJ P.5**: Use various techniques to factor polynomials. Factor algebraic expressions containing fractional and negative exponents.				

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-APR Arithmetic with Polynomials and Rational Expressions • How do you know when a rational expression is fully simplified?	**A-APR.7 Rewrite rational expressions.** (+) 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. **SMP.1** Make sense of problems and persevere in solving them.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ P.6: Specify numbers that must be excluded from the domain of a rational expression. Simplify, multiply, divide, add, and subtract rational expressions. Simplify complex rational expressions.	• Discovery Activity, p. 73. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Emphasize "Finding the Least Common Denominator" on p. 78 and "Adding and Subtracting Rational Expressions That Have Different Denominators" on p. 79. **Materials:** Mini-Lecture P.6, Power Point P.6, teacher-made transparencies, copies of the process for the above-mentioned procedures. Algebra and Trigonometry. Blitzer; Pearson, 2010	Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activity, p. 73. **Summative** • Quiz (P.6)	5 Days (including Quiz)

Unit 1: Equations & Inequalities **Grade: 10** **Date: 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-CED Creating Equations **A-REI** Reasoning with Equations and Inequalities • Why do we solve linear equations? • How can we use a linear model to solve problems? • How are slope and y-intercept interpreted in context of a real problem situation?	**A-CED.2 Create equations that describe numbers or relationships.** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A-REI.11 Represent and solve equations and inequalities graphically.** 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, radical, absolute value, and exponential functions. **A-REI.1 Understand solving equations as a process of reasoning and explain the reasoning.** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **A-REI.3 Solve equations and inequalities in one variable.** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters **SMP.3** Construct viable arguments and critique the reasoning of others. **SMP.4** Model with mathematics.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 1.1: Plot points and graph equations in the rectangular coordinate system. Use a graph to determine intercepts. Interpret information given by graphs. **OBJ 1.2:** Solve linear equations in one variable and those containing fractions. Solve rational equations with variables in the denominators. Recognize identities, conditional equations, and inconsistent	• Preview Exercises, p. 85. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Statistics)** • Emphasize that students can select any value to substitute for x when graphing, which is particularly helpful when graphing equations that contain fractions. • Preview Exercises, p. 100. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Discovery Activity, p. 104.	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activity, p. 104	7 Days

equations. Solve applied problems using mathematical models. **OBJ 1.3:** Use linear equations to solve problems. Solve a formula for a variable.	• **Technology**, pp. 105, 108, which help to make numeric and graphic connections. • Remind students that when multiplying through by the LCD to multiply every term on both sides of the equation. • Encourage students to look for restricted values of the variable before attempting to solve the rational equation. • Preview Exercises, p. 116. • Work through examples, reviewing the Study Tips throughout the lesson. • Emphasize the use of the "Strategy for Solving Word Problems" on p. 117. • Emphasize that solving an equation and answering the problem's question may not be the same thing. • Emphasize that the units on both sides of the equation must be the same. • Many times when solving a formula for a variable inside parentheses, students will divide rather than using the distributive property first. It is helpful to show the solution by both methods so that students can see the differences in the two forms of the answer. • Emphasize formulas on p. 123. • **Technology**, p. 121. **Materials:** Mini-Lecture 1.1, 1.2, 1.3 Power Point 1.1, 1.2, 1.3 teacher-made transparencies, graph paper, overhead graphing calculator. Algebra and Trigonometry. Blitzer; Pearson, 2010 **Interdisciplinary Connections:** Health, Business, & Geometry		**Summative** • Test (1.1 – 1.3)	

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
N-CN The Complex Number System **A-REI** Reasoning with Equations and Inequalities • How do we solve quadratic equations? • What do the solutions of a quadratic equation represent, algebraically and graphically?	**N-CN.1 Perform arithmetic operations with complex numbers.** Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real. **N-CN.2 Perform arithmetic operations with complex numbers.** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. **N-CN.3 Perform arithmetic operations with complex numbers.** Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

• How are the components of a quadratic equation interpreted graphically?	**A-REI.4a Solve equations and inequalities in one variable**. Solve quadratic equations in one variable. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. **A-REI.4b Solve equations and inequalities in one variable**. Solve quadratic equations in one variable. 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. **N-CN.7 Use complex numbers in polynomial identities and equations.** Solve quadratic equations with real coefficients that have complex solutions. **SMP.8** Look for and express regularity in repeated reasoning. **SMP.5** Use appropriate tools strategically.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 1.4: Add, subtract, multiply, and divide complex numbers. Perform operations with square roots of negative numbers. **OBJ 1.5:** Solve quadratic equations by factoring, using the square root property, completing the square, and using the Quadratic Formula. Use the discriminant to determine the number and type of solutions. Solve problems modeled by quadratic equations.	• Preview Exercises, p. 129. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Discourage the use of the FOIL method when multiplying a complex number by its conjugate (i.e., use the formula.) • Preview Exercises, p. 136. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • **Interdisciplinary Connections (Health; Geometry; Art; Engineering)** • Work an example like $x^2 = 25$ by factoring and by the square root method. This will help students remember that there will be two solutions when the square root method is used. Many times students will only give one solution when using the square root method. • Show the derivation of the Quadratic Formula • Warn students to be careful when working with the signs under the radical in the Quadratic Formula. • **Technology**, pp. 139-140, 143-144, 149. **Materials:** Mini-Lectures 1.4 & 1.5, Power Point 1.4 & 1.5, teacher-made transparencies, overhead graphing calculator. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Golden Rectangle Activity, p151 & p154 #137 • Discovery Activity, p 159 • Mid-Chapter Check Point p156-157 **Summative** • Quiz 1.4 & 1.5 **Performance Assessment** - Bagels or Donuts	6 Days

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-REI Reasoning with Equations and Inequalities • How do we solve different types of equations? • How do the processes of solving equations relate to those of solving inequalities?	**A-REI.11 Represent and solve equations and inequalities graphically.** 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, radical, absolute value, and exponential functions. **A-REI.1 Understand solving equations as a process of reasoning and explain the reasoning.** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **A-REI.2 Understand solving equations as a process of reasoning and explain the reasoning.** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **A-REI.3 Solve equations and inequalities in one variable.** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters **SMP.8** Look for and express regularity in repeated reasoning. **SMP.4** Model with mathematics.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
<u>OBJ 1.6</u>: Solve equations that involve factoring, radicals, rational exponents, quadratic type, and absolute value. Solve problems modeled by equations. **<u>OBJ 1.7</u>:** Use interval notation. Find intersections and unions of intervals. Solve linear, compound, and absolute value inequalities. Recognize inequalities with no	• Preview Exercises, p. 155. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Astrology; Engineering)** • Remind students that when they square both sides of an equation that $(x-3)^2 \neq x^2 - 3^2$. • Discovery Activity, p. 159. • **Technology**, pp. 159, 161, 163, 165, 167. • Preview Exercises, p. 172. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Discourage the use of open and closed circles on graphs. Using	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activity p177 **Summative** • Test 1.6 – 1.7	7 Days

solution or all real numbers as solutions.	parentheses and brackets reinforces the concepts of interval notation. • Many students will solve inequalities in-correctly if the variable is on the right side (Ex. $-2 \geq x$). Encourage them to flip the inequality around before writing the interval notation. • Do not allow students to break an absolute value inequality in the form $\lvert X \rvert \leq c$ (or $\lvert X \rvert < c$) into two separate inequalities. This does not reinforce the concept of intersection. • Discovery Activity, p. 177. • **Technology**, pp. 178, 180-181, 185. **Materials:** Mini-Lectures 1.5 & 1.6, Power Point 1.5 & 1.6, teacher-made transparencies, overhead graphing calculator. • Algebra and Trigonometry. Blitzer; Pearson, 2010			

Unit 2: Functions and Graphs **Grade: 10** **Date: April 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-IF Interpreting Functions • What determines whether a relation is a function or not? • What are the main characteristics of a function?	**F-IF.1 Understand the concept of a function and use function notation.** 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*). **F-IF.2 Understand the concept of a function and use function notation.** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. **F-IF.5 Interpret functions that arise in applications in terms of the context.** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **F-IF.7b Analyze functions using different representations.** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. **SMP.4** Model with mathematics.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 2.1: Find the domain and range of a relation. Determine whether a relation is a function and whether an equation represents a function. Evaluate a function. Graph a function by plotting points and obtain information about the function, including its domain, range, and intercepts. Use the Vertical Line Test to identify functions.	• Preview Exercises, p. 188. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Health; Social Studies)** • Emphasize that *y* is "what" (the value of the function) and *x* is "where" (the location of the value). This will be helpful later in discussing relative maxima and minima. • Draw a relation that is not a function. Have the points along a vertical line through the function labeled so that students can see the shared first components. • **Technology**, pp. 203, 205.	• Previewing Material • Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) **Summative** • Quiz 2.1 – 2.2	5 Days

OBJ 2.2: Identify intervals on which a function increases, decreases, or is constant. Use graphs to locate relative maxima or minima. Identify even or odd functions and recognize their symmetries. Understand and use piecewise functions. Find and simplify a function's difference quotient.	• Preview Exercises, p. 214. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Reinforce that the values of the relative maxima and minima are *y*-values. When determining where a function is in-creasing or decreasing by looking at its graph, emphasize that you should observe what is happening to the *y*-values as you move from the left to the right. **Materials:** Mini-Lectures 2.1 & 2.2, Power Point 2.1 & 2.2, teacher-made transparencies, overhead graphing calculator, graph paper. • Algebra and Trigonometry. Blitzer; Pearson, 2010		**Performance Assessment** "Books from Andonov"	

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-IF Interpreting Functions **S-ID** Interpreting Categorical and Quantitative Data • What does the slope of a line represent? • What does the y-intercept of a line represent? • How can functions be used to describe real-life situations?	**F-IF.6 Interpret functions that arise in applications in terms of the context.** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **S-ID.7 Interpret linear models.** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **SMP.4** Model with Mathematics **SMP.7** Look for and make use of structure

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 2.3: Calculate a line's slope. Write the point-slope form of the equation of a line. Write and graph the slope-intercept form of the equation of a line. Graph horizontal and vertical lines.	• Preview Exercises, p. 229. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Statistics; Science)** • Emphasize that the definition of the slope is "the change in *y* over the change in *x*".	• Graphing Calculator • Stations Activity	**Formative** • Student Response • Check Points • Homework (including open-ended questions)	4 days

Recognize and use the general form of a line's equation, and use intercepts to graph it. Model data with linear functions and make predictions. **OBJ 2.4:** Find slopes and equations of parallel and perpendicular lines. Interpret slope as rate of change. Find a function's average rate of change.	• Show how to derive the point-slope formula from the slope formula. • Discovery Activity, p. 233. • **Technology**, p. 239. • Preview Exercises, p. 243. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Social Studies)** • Emphasize slope as a rate of change by showing the change on a graph. • Spend time on the secant line, as this is a necessary preparation for calculus. **Materials:** Mini-Lectures 2.3 & 2.4, Power Point 2.3 & 2.4, teacher-made transparencies, overhead graphing calculator, graph paper. • Algebra and Trigonometry. Blitzer; Pearson, 2010		• Discovery Activity, p. 233 • Exploring Linear Data Activity (Oil Changes & Engine Repairs) • Mid-Chapter Check Point p253-254 **Summative** • Test 2.1 – 2.4 **Performance Assessment** – "Work with a Prediction Equation"	

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-BF Building Functions • What impact do transformations make on an equation and its graph? • How do we create new functions from parent functions? • How do we create an inverse function? • What is the relationship between an inverse function and the original function?	**F-BF.3 Build new functions from existing functions.** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, and $f(kx)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. **F-BF.4a Build new functions from existing functions.** 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 $x \neq 1$.* **F-BF.1.b Build a function that models a relationship between two quantities.** Write a function that describes a relationship between two quantities. Combine standard function types using arithmetic operations. **F-BF.4b Build new functions from existing functions.** Find inverse functions. Verify by composition that one function is the inverse of another. **F-BF.4c Build new functions from existing functions.** Find inverse functions. Read values of an inverse function from a graph or a table, given that the function has an inverse. **F-BF.4d Build new functions from existing functions.** Find inverse functions. Produce an invertible function from a non-invertible function by restricting the domain. **SMP.3** Construct viable arguments and critique the reasoning of others **SMP.4** Model with Mathematics

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 2.5: Recognize graphs of common functions. Use vertical / horizontal shifts, reflections, and vertical / horizontal stretching and shrinking to graph functions. Graph functions involving a sequence of transformations. **OBJ 2.6**: Find the domain of a function. Combine functions using the algebra of functions, specifying domains. Form and determine the domain for composite functions. Write functions as compositions. **OBJ 2.7**: Verify inverse functions. Find the inverse of a function and graph both functions on the same axes. Use the horizontal line test to determine if a function has an inverse. Use the graph of a one-to-one function to graph its inverse function.	• Preview Exercises, p. 252. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Give the students the standard function and a word description of the trans-formed function, and then have them find the equation of the transformed function. • Emphasize the "Summary of Transformations Chart" on p. 263. • Use a graphing calculator to show trans-formations. Begin with the standard function and show one transformation at a time on the screen. • Discovery Activity, p. 259. • Preview Exercises, p. 269. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Statistics; Social Studies)** • Review interval notation before discussing finding the domain of a function. • **Technology**, p. 274. • Preview Exercises, p. 282. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Plot 3 points of the form (a, b), and then plot the corresponding points of the form (b, a). Illustrate how the two graphs are reflections of each other in the line $y = x$. • Use a graphing calculator to graph a function, its inverse, and $y = x$ in the same plane. • Discovery Activities, pp. 286, 288. **Materials:** Mini-Lecture 2.5, Power Point 2.5, Mini-Lecture 2.6, 2.7 Power Point 2.6, 2.7 teacher-made transparencies, overhead graphing calculator, graph paper. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Color Coding • Graphing Calculator • Previewing Material	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activity, p. 259 **Summative** • Quiz 2.5 – 2.6 **Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activity, p. 259 • Discovery Activities, pp. 286, 288	3 Days 3 Days 3 Days

Unit 3: Polynomial and Rational Functions **Grade: 10** **Date: April 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-IF Interpreting Functions • What does the vertex of a quadratic function represent? What do the intercepts of both the y-axis and x-axis represent? • How are the domain and range affected in real world situations? • How do you graph a quadratic function in standard form? • How can quadratic models be used to describe physical relationships?	**F-IF.7a Analyze functions using different representations.** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph quadratic functions and show intercepts, maxima, and minima. **F-IF.8a Analyze functions using different representations.** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **F-IF.4 Interpret functions that arise in applications in terms of the context.** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. **F-IF.7c Analyze functions using different representations**. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. **F-IF.8a Analyze functions using different representations.** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **SMP.5** Use appropriate tools strategically. **SMP.4** Model with mathematics. **SMP.6** Attend to precision.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 3.1: Recognize characteristics of, and graph, parabolas. Determine a quadratic function's minimum and maximum values, and solve problems involving them.	• Preview Exercises, p. 302. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Athletics; Geometry)** • Stress the use of *a* from the standard form to determine the direction the parabola is opening before beginning to graph it.	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions)	5 Days

OBJ 3.2: Identify polynomial functions and recognize characteristics of their graphs. Determine end behavior. Use factoring to find zeros of polynomial functions and identify their multiplicities. Use the Intermediate Value Theorem. Understand the relationship between degree and turning points. Graph polynomial functions.	• When graphing a parabola, encourage students to first find its vertex, then use symmetry to find additional points on either side of the vertex. • **Technology**, pp. 322 – 323. • Preview Exercises, p. 327. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Health)** • Encourage students to use the Leading Coefficient Test because it helps to know, in general, what the graph should look like before beginning to graph it. • **Technology**, p. 333. Remind students that when using a graphing calculator to select a viewing window that will show the end behavior of the graph. **Materials:** Mini-Lectures 3.1 & 3.2, Power Point 3.1 & 3.2, teacher-made transparencies, overhead graphing calculator, graph paper. Algebra and Trigonometry. Blitzer; Pearson, 2010		**Summative** • **Performance Assessment** - "The Diving Problem" • Quiz 3.1 – 3.2	

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-APR Arithmetic with Polynomials and Rational Expressions • How do we divide polynomials? • What does the remainder that results from dividing polynomials represent? • When is it appropriate to use synthetic division processes versus long division?	**A-APR.1 Perform arithmetic operations on polynomials.** 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. **A-APR.2 Understand the relationship between zeros and factors of polynomials.** Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. **A-APR.3 Understand the relationship between zeros and factors of polynomials.** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **A-APR.6 Rewrite rational expressions.** Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system. **SMP.1** Make sense of problems and persevere in solving them. **SMP.8** Look for and express regularity in repeated reasoning.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 3.3: Use long and synthetic division to divide polynomials. Evaluate a polynomial using the Remainder Theorem. Use the Factor Theorem to solve a polynomial equation. **OBJ 3.4**: Use the Rational Zero Test to find possible rational zeros of polynomial functions. Solve polynomial equations. Use the Linear Factorization Theorem to find polynomials with given zeros. Use Descartes' Rule of Signs.	• Preview Exercises, p. 341. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Work a numeric long division problem to show the similarities to polynomial long division. • Emphasize the appropriate sign of c when dividing by $x - c$ using synthetic division • Remind students repeatedly that when dividing using either long division or synthetic division, they must put a zero in place of the missing power. • Remind students that they can check their answers for division problems by multiplying the quotient and the divisor and then adding any remainder. • **Technology**, p. 349. • Preview Exercises, p. 352. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Remind students that if c is the root, then $x - c$ is the linear factor. • **Technology**, p. 359. **Materials:** Mini-Lecture 3.3 & 3.4, Power Point 3.3 & 3.4, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator • Stations Activity	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Mid- Chapter Check Point p365 **Summative** • Test 3.1 – 3.4	6 Days

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-IF Interpreting Functions How do you graph a rational function? What do the asymptotes of a rational function represent?	**F-IF.7c Analyze functions using different representations**. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. **F-IF.5 Interpret functions that arise in applications in terms of the context.** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **SMP.4** Model with mathematics **SMP.5** Use appropriate tools strategically

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 3.5: Find the domains of rational functions. Use arrow notation. Identify vertical and horizontal asymptotes. Use transformations to graph rational functions. Identify slant asymptotes. Solve applied problems involving rational functions.	• Preview Exercises, p. 365. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Remind students to find the domain before reducing a rational function. • Emphasize that an asymptote is a line and must have the equation of a line (e.g., $y = 2$ as opposed to just "2"). • Before discussing "cost" as a function, give some concrete examples with no variables and have students work them. EX: A chair manufacturer has a fixed monthly cost of $10,000 and it costs $200 to make each chair. How much does it cost to make 2000 chairs? • Technology, pp. 370, 375, 376. **Materials:** Mini-Lecture 3.5, Power Point 3.5, teacher-made transparencies, graph paper. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) **Summative** Test 3.5 – 3.7	3 Days

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-REI Reasoning with Equations and Inequalities • How do we extend what we know about solving equations and inequalities to solving polynomial and rational inequalities?	**A-REI.11 Represent and solve equations and inequalities graphically.** 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, radical, absolute value, and exponential functions. **SMP.2** Reason abstractly and quantitatively **SMP. 7** Look for and make use of structure

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 3.6: Solve polynomial inequalities. Solve rational inequalities. Solve problems modeled by polynomial and rational inequalities.	• Preview Exercises, p. 383. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Remind students that the first step in solving a rational inequality is to have zero on one side of the inequality. • **Technology**, pp. 384, 386, 387, 389. **Materials:** Mini-Lecture 3.6, Power Point 3.6, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator • Number Line Models	**Formative** • Student Response • Check Points • Homework (including open-ended questions) **Summative** Test 3.5 – 3.6	3 Days 1 Day for Test

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-BF Building Functions • How can we use mathematical models to describe physical relationships?	**F-BF.1.a Build a function that models a relationship between two quantities.** Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context. **F-BF.1.b Build a function that models a relationship between two quantities.** Write a function that describes a relationship between two quantities. Combine standard function types using arithmetic operations. **SMP.4** Model with Mathematics

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 3.7: Solve direct, inverse, combined, and joint variation problems.	• Preview Exercises, p. 394. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Health; Science; Physics)** • Remind students to always find the constant of variation first, if enough information is given in the problem. • Emphasize the difference between joint variation and combined variation. **Materials:** Mini-Lecture 3.7, Power Point 3.7, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) **Summative** Test 3.5 – 3.6	2 Days 1 Day for Test

Unit 4: Exponential and Logarithmic Functions **Grade: 10** **Date: April 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-IF Interpreting Functions • What does the graph of an exponential function look like? • How is the graph of an exponential function affected by changes in coefficients and constants?	**F-IF.7e Analyze functions using different representations.** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Graph exponential and logarithmic functions, showing intercepts and end behavior. **F-IF.8b Analyze functions using different representations.** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. Use the properties of exponents to interpret expressions for exponential functions. **F-BF.5 Build new functions from existing functions.** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. **SMP.4** Model with Mathematics **SMP.7** Look for and make use of structure

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 4.1: Evaluate and graph exponential functions. Evaluate functions with base *e*. Use compound interest formulas. **OBJ 4.2**: Change from logarithmic form to exponential form and vice-versa. Evaluate logarithms. Use basic logarithmic properties. Graph a logarithmic function and find its domain. Use common and natural logarithms.	• Preview Exercises, p. 404. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Environmental Studies; Business)** • Review transformations with students. • Review the values of *n* associated with the terms "quarterly", "monthly", and "semi-annually. • **Technology**, p. 417. • Preview Exercises, p. 424 • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Science)** • Review inverse functions with students. • When evaluating logarithms, continually remind students what the answer represents (i.e., an unknown exponent). • Use the overhead graphing calculator to show students where the value of *e* comes from. **Materials:** Mini-Lecture 4.1, Power Point 4.1, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) **Summative** • **Performance Assessment -** "An Investment Opportunity" • Quiz 4.1 – 4.2	5 Days

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-LQE Linear, Quadratic, and Exponential Models • What is the relationship between exponential and logarithmic equations? • How do you solve an exponential or logarithmic equation? • What does the solution of an exponential or logarithmic equation represent?	**F-LQE.4 Construct and compare linear and exponential models and solve problems.** For exponential models, express as a logarithm the solution to $a\,b^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. **SMP.1** Make sense of problems and persevere in soling them **SMP.8** Look for and express regularity in repeated reasoning

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 4.3: Use the product, quotient, and power rules. Expand and condense logarithmic expressions. Use the change-of-base property. **OBJ 4.4**: Use like bases and logarithms to solve exponential equations. Use the definition of a logarithm and the one-to-one property of logarithms to solve logarithmic equations.	• Preview Exercises, p. 437. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Emphasize logarithms as exponents. • Use an example to show that $\log_b(M+N) \neq \log_b M + \log_b N$. • Make sure students understand what the results should look like when they "expand" and "condense". • Preview Exercises, p. 446. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Chemistry; Biology)** • Emphasize checking solutions when solving logarithmic equations. • Emphasize isolating the base first when solving exponential equations. Likewise, emphasize getting one logarithm on one side of a logarithmic equation before solving (e.g., expanding/condensing or adding/subtracting a constant). • Discovery Activities, pp. 449, 450. • **Technology**, pp. 448, 451, 452, 454. **Materials:** Mini-Lecture 4.4, Power Point 4.4, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Matching Activities	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Mid-Chapter Check Point p447 • Discovery Activities, pp. 449, 450 **Summative** • Test 4.1 – 4.4	6 Days

Unit 5: Trigonometric Functions **Grade: 10** **Date: April 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
G-C Circles • How do geometric relationships help to solve problems and/or make sense of phenomena?	**G-C.5 Find arc lengths and areas of sectors of circles.** Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. **SMP.3** Construct viable arguments and critique the reasoning of others

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 5.1: Recognize and use the vocabulary of angles. Use degree and radian measure. Convert between radians and degrees. Draw angles in standard position. Find coterminal angles and length of a circular arc. Use linear and angular speed to describe motion on a circular path.	• Preview Exercises, p. 473. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Chemistry; Biology)** • Derive the formulas for converting degrees to radians and radians to degrees. • Emphasize the Figure 5.15 "Degree and radian measures of selected positive and negative angles" in the book. • Discovery Activity, p. 492 • **Technology**, p. 484, **Materials:** Mini-Lecture 5.1, Power Point 5.1, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Group Investigations	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activity, p. 492 **Summative** • Quiz 5.1 – 5.2	3 Days

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
G-SRT Similarity, Right Triangles, and Trigonometry **F-TF.8** Trigonometric Functions • How do geometric relationships help to solve problems and/or make sense of phenomena?	**G-SRT.6 Define trigonometric ratios and solve problems involving right triangles.** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. **G-SRT.7 Define trigonometric ratios and solve problems involving right triangles.** Explain and use the relationship between the sine and cosine of complementary angles. **G-SRT.8 Define trigonometric ratios and solve problems involving right triangles.** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

	F-TF.7 Model periodic phenomena with trigonometric functions. 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. **F-TF.8 Prove and apply trigonometric identities.** Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant. **F-TF.9 Prove and apply trigonometric identities.** Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. **SMP.4** Model with mathematics. **SMP.5** Use appropriate tools strategically

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 5.2: Use right triangles to evaluate trigonometric functions and to solve applied problems. Find function values for $30^0\left(\frac{\pi}{6}\right)$, $45^0\left(\frac{\pi}{4}\right)$, and $60^0\left(\frac{\pi}{3}\right)$. Recognize and use fundamental identities. Use equal cofunctions of complements. Evaluate trigonometric functions with a calculator.	• Preview Exercises, p. 497. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • **Interdisciplinary Connections (Science)** • Emphasize "Right Triangle Definitions of Trigonometric Functions" from text • Show students the equivalent of Pythagorean Identities • Show derivation of trigonometric identities **Materials:** Mini-Lectures 5.2, Power Point 5.2, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activities, p. 518, 520, 521 **Summative** • Quiz 5.1 – 5.2	2 Days

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
F-TF Trigonometric Functions • How do you extend your knowledge of acute angles to find trigonometric ratios of any angle?	**F-TF.2 Extend the domain of trigonometric functions using the unit circle.** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. **F-TF.1 Extend the domain of trigonometric functions using the unit circle.** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. **F-TF.5 Model periodic phenomena with trigonometric functions.** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. **F-TF.3 Extend the domain of trigonometric functions using the unit circle.** Use special triangles to determine geometrically the values of sine, cosine, tangent for π /3, π/4 and π/6, and use the unit circle to express

	the values of sine, cosine, and tangent for π-x, π+x, and 2π-x in terms of their values for x, where x is any real number. **F-TF.4 Extend the domain of trigonometric functions using the unit circle.** Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. **SMP.4** Model with mathematics. **SMP.7** Look for and make use of structure. **SMP.8** Look for and express regularity in repeated reasoning.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 5.3: Use the definitions of trigonometric functions of any angle. Use the signs of the trigonometric functions. Find reference angles. Use reference angles to evaluate trigonometric functions. **OBJ 5.4:** Use a unit circle to define trigonometric functions of real numbers. Recognize the domain and range of sine and cosine functions. Use even and odd trigonometric functions. Use periodic properties. **OBJ 5.5:** Understand the graph of $y = \sin x$ and $y = \cos x$. Graph variations of $y = \sin x$ and $y = \cos x$. Use vertical shifts of sine and cosine curves. Model periodic behavior	• Preview Exercises, p. 513. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Geometry)** • Encouraging students to draw θ in standard position will help them find the reference angle. • Emphasize "Using Reference Angles to Evaluate Trigonometric Functions" in the book. • Discovery Activities, p. 518, 520, 521 • Preview Exercises, p. 526. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Emphasize 'Definitions of Trigonometric Functions in Terms of a Unit Circle" from text • Discuss the repetitive nature of the sine, cosine, and tangent functions • Preview Exercises, p. 535. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Physics)** • Emphasize "Graphing Variations of $y = \sin x$"and "Graphing Variations of $y = \cos x$" in the book • Show variations of the basic sine and cosine functions using the graphing calculator. Plot the basic curve and the variation in the same window.	• Group Investigations • Previewing Material	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Mid-Chapter Checkpoint p 535-536 **Summative** • Unit Circle Quiz • Quiz 5.3 & 5.4 • Quiz 5.5 **Performance Assessment –** "Trigonometry through Geometry"	8 Days

	• **Technology** p. 548, 550, & 553. **Materials:** Mini-Lectures 5.3, 5.4 & 5.5, Power Point 5.3, 5.4 & 5.5, teacher-made transparencies, blank unit circles, graph paper Algebra and Trigonometry. Blitzer; Pearson, 2010			

Unit 8: Systems of Equations and Inequalities **Grade: 10** **Date: April 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-REI Reasoning with Equations and Inequalities • How do you solve a system of linear and nonlinear equations or inequalities? • What does the solution of an algebraic system represent?	**A-REI.5 Solve systems of equations.** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions **A-REI.6 Solve systems of equations.** Solve systems of linear equations exactly and approximately, focusing o pairs of linear equations in two variables. **A-REI.7 Solve systems of equations**. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. **A-REI.10 Represent and solve equations and inequalities graphically.** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **A-REI.12 Represent and solve equations and inequalities graphically.** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. **SMP.2** Reason abstractly and quantitatively. **SMP.4** Model with mathematics.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 8.1: Decide whether an ordered pair is a solution of a linear system. Solve linear systems by substitution and addition. Identify systems that do not have exactly one ordered-pair solution. Solve problems using systems of linear equations.	• Preview Exercises, p. 741. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Emphasize "Solving Linear Systems by Substitution" and "Solving Linear Systems by Addition" in the book. • Review cost and revenue before working break-even problems. • Emphasize "The Number of Solutions to a System of Two Linear Equations" in the book.	• Graphing Calculator • Color Coding •	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Discovery Activity, p. 755 • Group Exercise p763 #102	8 Days

OBJ 8.4: Recognize systems of nonlinear equations in two variables. Solve nonlinear systems by substitution and addition. Solve problems using systems of nonlinear equations **OBJ 8.2:** Verify the solutions of a system of linear equations in three variables. Solve systems of linear equations in three variables. Solve problems using systems in three variables. **OBJ 8.5**: Graph a linear and nonlinear inequality in two variables. Use mathematical models involving linear inequalities. Graph a system of inequalities.	• Discovery Activity, p. 755 • Technology, p. 751 • Preview Exercises, p. 783. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Business)** • Remind students that they must check their answers in both equations. • Emphasize that when taking the square root of both sides of an equation that there will be two answers, one positive and one negative. • Preview Exercises, p. 763. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Emphasize "Solving Linear System in Three Variables by Eliminating Variables" in the book. • Emphasize that the solution must be check in all three equations. • Take a system and solve it two different ways in order to emphasize that it doesn't matter which variable is eliminated first. • **Technology** p. 769. • Preview Exercises, p. 793. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Health)** • Emphasize "Graphing a Linear Inequality in Two Variables" in the book. • Remind students to pick an easy test point, like (0, 0), when trying to decide where to shade. • Technology, p. 796 **Materials:** Mini-Lectures 8.1, 8.2, 8.4, & 8.5, Power Point 8.1, 8.2, 8.4, & 8.5, teacher-made transparencies, graph paper Algebra and Trigonometry. Blitzer; Pearson, 2010		**Summative** • Quiz 8.1, 8.2 & 8.4 • **Performance Assessment -** "Interpreting Graphs II"	

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-CED Creating Equations • How can we use mathematical models to describe physical relationships? • How are graphing techniques used to determine maximum or minimum quantities?	**A-CED.1 Create equations that describe numbers or relationships.** Create equations and inequalities in one variable and use them to solve problems. **A-CED.2 Create equations that describe numbers or relationships.** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A-CED.3 Create equations that describe numbers or relationships.** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. **SMP.4** Model with Mathematics

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 8.6: Write an objective function describing a quantity that must be maximized or minimized. Use inequalities to describe limitations in a situation. Use linear programming to solve problems.	• Preview Exercises, p. 806. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Social Studies)** • Emphasize "Solving a Linear Programming Problem" in the book. • Using the "intersection" function on a graphing calculator to find the corner points may help correctly graph. **Materials:** Mini-Lecture 8.6, Power Point 8.6, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator • Color Coding	**Formative** • Student Response • Check Points • Homework (including open-ended questions)	2 Days

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
A-APR Arithmetic with Polynomials and Rational Expressions What do the parts of a rational expression look like? How do I find the sum or difference of a simplified rational expression? Why would we need to "decompose" one rational expression into two or more rational expressions?	**A-APR.7 Rewrite rational expressions.** 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. **A-APR.6 Rewrite rational expressions.** Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

	SMP.7 Look for and make use of structure. **SMP.8** Look for and express regularity in repeated reasoning.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 8.3: Decompose $\frac{P}{Q}$, where Q has only distinct linear factors, repeated linear factors, non-repeated prime quadratic factor, or a prime repeated quadratic factor.	• Preview Exercises, p. 772. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Emphasize "Steps in Partial Fraction Decomposition" in the book. • Give students some practice at first with just identifying which case is represented by a problem. • **Technology** p. 779. **Materials:** Mini-Lecture 8.3, Power Point 8.3, teacher-made transparencies. Algebra and Trigonometry. Blitzer; Pearson, 2010	• Graphing Calculator	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Mid-Chapter Check Point p793 **Summative:** • Quiz 8.5, 8.6, 8.3	4 Days

Unit 10: Conic Sections **Grade: 10** **Date: April 2012**

NJ-CCSS **Domain** **Essential Questions**	**NJ-CCSS** **Cluster.Standard** **Standards for Mathematical Practice**
G-GPE Expressing Geometric Properties with Equations • What is meant by the term "conic section?" • How do you derive equations for various shapes? • How do you graph equations that are quadratic in form on the coordinate plane?	**G-GPE.3 Translate between the geometric description and the equation for a conic section.** Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. **SMP.2** Reason abstractly and quantitatively. **SMP.4** Model with mathematics.

Skills/Objectives SWBAT…	**Instructional Strategies** Activities/ Materials /Technology Interdisciplinary Connections Cultural Diversity	**Modifications** ESL / Special Education Academic Support/G&T Differentiated Instruction	**Assessments** Formative Summative Benchmarks	**Pacing**
OBJ 2.8: Find the distance between two points. Find the midpoint of a line segment. Write the standard form of a circle's equation. Give the center and radius of a circle whose equation is in standard form. Convert the general form of a circle's equation to standard form. **OBJ 10.1**: Graph ellipses centered and not centered at the origin. Write equations of ellipses in standard form. Solve applied problems involving ellipses. **OBJ 10.2**: Locate a hyperbola's vertices and foci. Write equations of hyperbolas in standard form.	• Preview Exercises, p. 293. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. • Emphasize taking the opposite signs of those in the parentheses when finding the center of a circle. • Show how $(x-h)^2+(y-k)^2=r^2$ becomes $x^2+y^2=r^2$ when the center of the circle is at the origin. • **Technology**, pp. 297, 299. • Preview Exercises, p. 884. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Astrology; Physics)** • Emphasize "Standard Forms of Equations of Ellipse Centered at (h,k)" in the book. • Emphasize that the form $c^2=a^2+b^2$ $\left(a^2>b^2\right)$ is the best one to learn for the ellipse. • **Technology**, p. 893. • Preview Exercises, p. 901. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson **Interdisciplinary Connections**	• Graphing Calculator • Streaming Videos	**Formative** • Student Response • Check Points • Homework (including open-ended questions) • Mid-Chapter Check Point p928	11 Days

Graph hyperbolas centered and not centered at the origin. Solve applied problems involving hyperbolas. **OBJ 10.3**: Graph parabolas with vertices at the origin and not at the origin. Write equations of parabolas in standard form. Solve applied problems involving parabolas.	**(Science)** • Emphasize "Standard Forms of Equations of Hyperbola Centered at (h,k)" in the book. • Emphasize that the form $c^2 = a^2 + b^2$ is the best one to learn for the hyperbola. • Emphasize the difference in the equations of the asymptotes based on whether the transverse axis is vertical or horizontal. • **Technology**, p. 907. • Preview Exercises, p. 916. • Define key terms and work through examples, reviewing the Study Tips throughout the lesson. **Interdisciplinary Connections (Science)** • Emphasize "Standard Forms of Equations of Parabolas with Vertex at (h,k)" in the book. • Remind students that the focus will be "inside" the parabola and the directrix will be "outside" the parabola. This can help them graph the parabola. • **Technology**, p. 919, 920, 922, & 923. **Materials:** Mini-Lecture 10.3, Power Point 10.3, teacher-made transparencies, Streaming Videos on conics Algebra and Trigonometry. Blitzer; Pearson, 2010		**Summative** • Quiz 2.8 & 10.1 • Conics Test **Performance Assessment -** "Draw it, Write it, Do it"	

NORTH BRUNSWICK TOWNSHIP HIGH SCHOOL

(2665) Honors Algebra II
Grade 10
5 Credits - 1 Year

Course Description:

Honors Algebra II is a continuation of the honors program. The study of functions is extended to include higher degree polynomials, exponential, logarithmic, circular, and quadratic functions. The real number system is expanded to include the complex numbers. Use of a graphing calculator is an important part of the course; therefore, the purchase of a TI-83+ or better graphing calculator is strongly recommended. Students must complete a summer assignment.

Proficiencies:

At the completion of this course, the student will be able to:

1. Interpret the structure of expressions.
2. Write expressions in equivalent forms to solve problems.
3. Perform arithmetic operations on polynomials.
4. Rewrite rational expressions.
5. Create equations that describe numbers or relationships.
6. Represent and solve equations and inequalities graphically
7. Understand solving equations as a process of reasoning and explain the reasoning.
8. Solve equations and inequalities in one variable.
9. Perform arithmetic operations with complex numbers.
10. Understand the concept of a function and use function notation.
11. Interpret functions that arise in applications in terms of the context.
12. Analyze functions using different representations.
13. Interpret linear models.
14. Build new functions from existing functions.
15. Build a function that models a relationship between two quantities.
16. Understand the relationship between zeros and factors of polynomials. .
17. Construct and compare linear and exponential models and solve problems.
18. Find arc lengths and areas of sectors of circles.
19. Define trigonometric ratios and solve problems involving right triangles.
20. Prove and apply trigonometric identities.
21. Model periodic phenomena with trigonometric functions
22. Extend the domain of trigonometric functions using the unit circle.
23. Solve systems of equations.
24. Translate between the geometric description and the equation for a conic section.

Course Requirements:

Students will be expected to read the text, do written homework as assigned, contribute to class discussion, and take periodic quizzes and tests, including a mid-term exam and a final exam.

Evaluation Procedures:
Marking period grades will be determined as follows:

Performance Assessments	90%
Homework	10%

revised 4/2012