Algebra II Curriculum

This curricula and accompanying instructional materials have been developed to align with the NJSLS and in accordance with the NJ Department of Education's guidelines to include: Curriculum designed to meet grade level expectations, integrated accommodations and modifications for students with IEPs, 504s, ELLs, and gifted and talented students, assessments including benchmarks, formative, summative, and alternative assessments, a list of core instructional and supplemental materials, pacing guide, interdisciplinary connections, integration of 21st century skills, integration of technology, and integration of 21st Century Life and Career standards.

About the Standards

In 1996, the New Jersey State Board of Education adopted the state's first set of academic standards called the Core Curriculum Content Standards. The standards described what students should know and be able to do upon completion of a thirteen-year public school education. Over the last twenty years, New Jersey's academic standards have laid the foundation for local district curricula that is used by teachers in their daily lesson plans.

Revised every five years, the standards provide local school districts with clear and specific benchmarks for student achievement in nine content areas. Developed and reviewed by panels of teachers, administrators, parents, students, and representatives from higher education, business, and the community, the standards are influenced by national standards, research-based practice, and student needs. The standards define a "Thorough and Efficient Education" as guaranteed in 1875 by the New Jersey Constitution. Currently the standards are designed to prepare our students for college and careers by emphasizing high-level skills needed for tomorrow's world.

The New Jersey Student Learning Standards include Preschool Teaching and Learning Standards, as well as nine K-12 standards for the following content areas: **21st Century Life and Careers, Comprehensive Health and Physical Education, English Language Arts, Mathematics, Science, Social Studies, Technology, Visual and Performing Arts, World Languages**

The most recent review and revision of the standards occurred in 2014. However, the standards in language arts and math underwent an additional review in 2015 with adoption by the New Jersey State Board of Education in May 2016.

Lower Cape May Regional School District - ALGEBRA II Curriculum	
Content Area: Mathematics	
Course Title: Algebra II	**Grade level: 9 – 12**
Unit 1: Linear Functions, Quadratic Functions, Quadratic Equations & Complex Numbers	**September - December**
Unit 2: Polynomial Functions, Rational Exponents & Radical Functions	**January - March**
Unit 3: Exponential & Logarithmic Functions, Rational Functions	**April - May**
Unit 4: Matrices	**June**
Date Created: 6/17/21	**Board Approved on: 6/24/21**

Lower Cape May Regional School District - ALGEBRA II Curriculum
Unit 1 Overview

Content Area: Mathematics

Unit Title: Linear & Quadratic Functions, Quadratic Equations & Complex Numbers

Target Course/Grade Level: 9 – 12

Unit Summary:

In Unit 1:

- Identify families of functions
- Describe & write transformations of parent functions (linear & quadratic)
- Write equations of linear functions & find lines of best fit
- Solve systems of equations in three variables algebraically
- Identify properties of parabolas (vertex, axis of symmetry, focus, directrix, etc.)
- Find maximum & minimum values of quadratic functions
- Graph quadratic functions in standard from, vertex form, intercept form
- Write equations of parabolas & quadratic functions (in standard form, vertex form, & intercept form)
- Solve quadratic equations by graphing, algebraically, using square roots, by completing the square, & using the Quadratic Formula
- Analyze the discriminant to determine the number & type of solutions
- Define & use the imaginary unit "i"
- Perform arithmetic operations with complex numbers
- Find complex solutions & zeros
- Solve systems of nonlinear equations
- Graph quadratic inequalities in two variables
- Solve quadratic inequalities in one variable
- Solve real life problems & write equations (linear & quadratic) to model data sets

Interdisciplinary Connections:

- Projectile motion
- Solar energy (parabolic mirrors)
- Electrical circuits (complex numbers)

21st Century Themes, Skills, and Standards:

CRP2 - Apply appropriate academic and technical skills.
CRP4 - Communicate clearly and effectively and with reason.
CRP8- Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11- Use technology to enhance productivity.

Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HSF-BF.B.3	Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), …, f(x + k) for specific values of k (both positive and negative); … Experiment with cases & illustrate an explanation of the effects on the graph using technology.
HSA-CED.A.2	Create equations in two variables to represent relationships between quantities; graph equations on coordinate axes with labels & scales.
HSS-ID.B.6a	Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
HSA-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
HSF-IF.C.7c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
HSA-APR.B.3	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.
HSF-IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs & tables in terms of the quantities, & sketch graphs showing key features given a verbal description of the relationship.
HSF-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, … or by verbal descriptions).

HSA-REI.B.4b	Solve quadratic equations by inspection, 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 & write them as $a \pm bi$ for real numbers *a* & *b*.
HSF-IF.C.8a	Use the process of factoring & completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, & interpret these in terms of a context.
HSN-CN.A.1	Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form *a* + *bi* with *a* & *b* real.
HSN-CN.A.2	Use the relation $i^2 = -1$ and the commutative, associative, & distributive properties to add, subtract, & multiply complex numbers.
HSN-CN.C.7	Solve quadratic equations with real coefficients that have complex solutions.
HSA-REI.C.7	Solve a simple system consisting of a linear equation & a quadratic equation in two variables algebraically & graphically.
HSA-REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations y = f(x) & y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately …
HSA-CED.A.1	Create equations & inequalities in one variable & use them to solve problems. *Include equations arising from linear & quadratic functions …*

Unit Enduring Questions:	**Unit Enduring Understandings:**
● What are the characteristics of the basic parent functions? ● How do the graphs of y = f(x) + k, y = f(x-h), & y = - f(x) compare to the graph of the parent function f? ● How can you use a linear function to model & analyze a real-life situation? ● How can you determine the number of solutions of a linear system? ● How do the constants *a*, *h*, & *k* affect the graph of the quadratic function $g(x) = a(x-h)^2 + k$? ● What type of symmetry does the graph of $f(x) = a(x-h)^2 + k$ have & how can you describe this symmetry? ● How can you use a quadratic function to model a real-life situation? ● How can you use the graph of a quadratic equation to determine the number of real solutions of the equation? ● What are the subsets of the set of complex numbers? ● How can you complete the square for a quadratic expression? ● How can you solve a nonlinear system of equations? ● How can you solve a quadratic inequality?	● Solve simple systems consisting of a linear and quadratic equation in two variables algebraically and graphically. ● Solve algebraically a system of three linear equations. ● Identify families of functions & describe transformations of parent functions. ● Write functions representing combinations of transformations. ● Write equations of linear functions & find lines of best fit. ● Solve systems of linear equations in three variables algebraically. ● Identify properties of parabolas, write equations of parabolas, & graph quadratic functions. ● Solve quadratic equations by graphing & algebraically. ● Define & use the imaginary unit *i* ● Add, subtract, and multiply complex numbers. ● Find complex solutions & zeros. ● Solve quadratic equations by taking square roots, completing the square, quadratic formula, and factoring. ● Write quadratic functions in vertex form. ● Analyze the discriminant to determine the number & type of solutions. ● Solve systems of nonlinear equations. ● Graph quadratic inequalities in two variables. ● Solve quadratic inequalities in one variable.

Unit Objectives: ***Students will know….***	**Unit Objectives:** ***Students will be able to…...***
● How to solve systems consisting of linear/ quadratic equations & inequalities in two/three variables algebraically and graphically. ● How to identify families of functions & describe transformations of parent functions. ● How to write functions representing combinations of transformations. ● How to write equations of linear functions & find lines of best fit. ● Properties of parabolas, how to write equations of parabolas, & graph quadratic functions. ● How to solve quadratic equations by graphing & algebraically. ● How to define & use the imaginary unit *i* ● How to add, subtract, and multiply complex numbers. ● How to find complex solutions & zeros. ● How to solve quadratic equations by taking square roots, completing the square, quadratic formula, and factoring. ● How to write quadratic functions in vertex form. ● How to analyze the discriminant to determine the number & type of solutions. ● How to graph quadratic inequalities in two variables. ● How to solve quadratic inequalities in one variable.	● Solve simple systems consisting of a linear and quadratic equation in two variables algebraically and graphically. ● Solve algebraically a system of three linear equations. ● Identify families of functions & describe transformations of parent functions. ● Write functions representing combinations of transformations. ● Write equations of linear functions & find lines of best fit. ● Solve systems of linear equations in three variables algebraically. ● Identify properties of parabolas, write equations of parabolas, & graph quadratic functions. ● Solve quadratic equations by graphing & algebraically. ● Define & use the imaginary unit *i* ● Add, subtract, and multiply complex numbers. ● Find complex solutions & zeros. ● Solve quadratic equations by taking square roots, completing the square, quadratic formula, and factoring. ● Write quadratic functions in vertex form. ● Analyze the discriminant to determine the number & type of solutions. ● Solve systems of nonlinear equations. ● Graph quadratic inequalities in two variables. ● Solve quadratic inequalities in one variable.

Lower Cape May Regional School District - ALGEBRA II Curriculum
Unit 2 Overview

Content Area: Mathematics

Unit Title: Polynomial Functions, Rational Exponents & Radical Functions

Target Course/Grade Level: 9 – 12

Unit Summary:

In Unit 2:

- Identify polynomial functions
- Graph polynomial functions using tables, end behavior & x-intercepts
- Add, subtract, multiply, & divide polynomials
- Use Pascal's Triangle to expand binomials
- Use long division to divide polynomials
- Use synthetic division to divide polynomials by binomials of the form $x - k$
- Use the Remainder Theorem
- Factor polynomials & use the Factor Theorem
- Find solutions of polynomial equations & zeros of polynomial functions
- Use the Rational Root Theorem
- Use the Irrational Conjugates Theorem
- Use the Fundamental Theorem of Algebra
- Use Descartes' Rule of Signs
- Describe & write transformations of polynomial functions
- Find turning points & identify local maximums & minimums of graphs of polynomial functions
- Identify even & odd functions
- Write polynomial functions for sets of points & using finite differences
- Use technology to find models for data sets
- Find *n*th roots of numbers & solve equations using *n*th roots
- Evaluate expressions with rational exponents
- Use properties of rational exponents to simplify expressions with rational exponents
- Use properties of radicals to simplify & write radical expressions in simplest form
- Graph radical functions & write transformations of radial functions
- Graph parabolas & circles
- Solve radical equations & inequalities, solve equations containing rational exponents
- Find & verify inverses of nonlinear functions
- Solve real-life problems using inverse functions

Interdisciplinary Connections:

- Hooke's Law,
- Heartbeat rates
- Sustained wind velocity (hurricane)
- Hang time

21st Century Themes, Skills, and Standards:

CRP2 - Apply appropriate academic and technical skills.
CRP4 - Communicate clearly and effectively and with reason.
CRP8- Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11- Use technology to enhance productivity.

Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HSA.APR.B.2	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).
HSA.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 $(x^2 - y^2)(x^2 + y^2)$.
HSA.SSE.B.3	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.
HSA.REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
HSA.REI.A.1	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.
HSF.IF.B.4	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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
HSF.IF.B.6	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.

HSA.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.*
HSF-IF.C.7c	Graph polynomial functions, … showing end behavior
HSA-APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, & multiplication; add, subtract, & multiply polynomials.
HSA-APR.D.6	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x) …
HSA-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, & use the zeros to construct a rough graph of the function defined by the polynomial.
HSN-CN.C.8	Extend polynomial identities to the complex numbers.
HSN-CN.C.9	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials
HSF-BF.B.3	Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), …, f(x + k) for specific values of k (both positive and negative); … Experiment with cases & illustrate an explanation of the effects on the graph using technology.
HSA-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels & scales.
HSF-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
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.
HSN-RN.A.2	Rewrite expressions involving radicals & rational exponents using the properties of exponents.
HSF-IF.C.7b	Graph square root, cube root, … functions
HSF-BF.B.4a	Solve an equation of the form f(x) = c for a simple function *f* that has an inverse & write an expression for the inverse.

Unit Enduring Questions:	**Unit Enduring Understandings:**
• What are some common characteristics of the graphs of cubic & quartic polynomial functions? • How can you cube a binomial? • How can you use the factors of a cubic polynomial to solve a division problem involving the polynomial? • How can you factor a polynomial? • How can you determine whether a polynomial equation has a repeated solution? Imaginary solutions? • How can you transform the graph of a polynomial function? • How many turning points can the graph of a polynomial function have? • How can you find a polynomial model for real-life data? • How can you use a rational exponent to represent a power involving a radical? • How can you use properties of exponents to simplify products & quotients of radicals? • How can you identify the domain & range of a radical function? • How can you solve a radical equation? • How can you sketch the graph of the inverse of a function?	• Apply the Remainder Theorem to determine the factors of a polynomial. • Use long division & synthetic division to divide polynomials, & to find roots of polynomials. • Add, subtract, multiply, & divide polynomials • Use an appropriate factoring technique to factor polynomials. Explain the relationship between zeros and factors of polynomials, and use the zeros to construct a rough graph of the function defined by the polynomial. • Graph polynomial functions from equations; identify zeros when suitable factorizations are available; show key features and end behavior. • Use the Fundamental Theorem of Algebra & Descartes' Rule of Signs • Describe & write transformations of polynomial functions. • Identify even & odd functions. • Write polynomial functions for sets of points & using finite differences. • Use technology to find models for data sets. • Find *n*th roots & solve equations using *n*th roots. • Evaluate expressions with rational exponents. • Use properties of rational exponents & radicals to simplify expressions. • Solve simple rational and radical equations in one variable, use them to solve problems and show how extraneous solutions may arise. Create simple rational equations in one variable and use them to solve problems. • For radical functions, 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. • Find & verify inverses of nonlinear functions, solve real-life problems using inverse functions.

Unit Objectives:

Students will know….

- Polynomial division: For a polynomial $p(x)$ and a number *a:*

$p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$

$(x – a)$ is a factor of $p(x)$ if and only if $p(a) = 0$

- Factors of polynomials can be used to identify zeros to be used to develop a rough graph of the polynomial function.
- Factors of polynomials can be used to identify zeros to be used to develop a rough graph of the polynomial function.
- Polynomial identities can be used to describe numerical relationships.
- Rational expressions can be written in different forms.
- Inverse relationships exist between roots and powers.
- Extraneous solutions do not result in true statements.
- A radical function is any function that contains a variable inside a root.
- Any point on a parabola is equidistant between the focus and the directrix.
- Solutions to complex systems of nonlinear functions can be approximated graphically.

Unit Objectives:

Students will be able to…...

- use the Remainder Theorem to determine factors of a polynomial.
- Factor polynomials.
- Use the zeros of the polynomial to create rough graph.
- Graph a polynomial function given its equation.
- Identify zeros from the graph and using an appropriate factoring technique.
- Use technology to graph and describe key features of the graph for complicated cases.
- 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 $b(x)$.
- Use inspection, factoring and long division to rewrite rational expressions.
- Find *n*th roots & solve equations using *n*th roots.
- Identify even & odd functions.
- Use the Fundamental Theorem of Algebra & Descartes' Rule of Signs
- Evaluate expressions with rational exponents.
- Use properties of rational exponents & radicals to simplify expressions.
- Use the inverse relationship between roots and powers when solving radical equations.
- Identify any extraneous solutions.
- Interpret key features of radical functions from graphs and tables in the context of the problem.
- Graph radical functions
- Identify intercepts and intervals where function is increasing/decreasing.
- Determine the practical domain of a radical function.
- Determine key features including intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maxima and minima; symmetries; end behavior.

Lower Cape May Regional School District - ALGEBRA II Curriculum
Unit 3 Overview

Content Area: Mathematics

Unit Title: Exponential & Logarithmic Functions, Rational Functions

Target Course/Grade Level: 9 - 12

Unit Summary:

In Unit 3:

- Graph exponential growth & decay functions
- Use exponential models to solve real-life problems.
- Define & use the natural base *e*, graph natural base functions.
- Use inverse properties of logarithmic & exponential functions.
- Graph logarithmic functions
- Transform graphs of logarithmic & exponential functions, write transformations of logarithmic/exponential functions.
- Use the properties of logarithms to evaluate logarithms.
- Use the properties of logarithms to expand or condense logarithmic expressions.
- Use the change-of-base formula to evaluate logarithms.
- Solve exponential & logarithmic equations & inequalities.
- Classify data sets.
- Write exponential functions.
- Use technology to find exponential & logarithmic models.
- Classify direct & inverse variation, write inverse variation equations.
- Graph rational functions, translate simple rational functions.
- Simplify rational expressions.
- Add, subtract, multiply, & divide rational expressions.
- Rewrite rational expressions & graph the related function.
- Simplify complex fractions.
- Solve rational equations (by cross multiplying, by using the least common denominator)
- Use inverses of rational functions.

Interdisciplinary Connections:

- Newton's Law of Cooling
- Compounded Interest
- Population Growth
- Value depreciation
- Earthquake magnitude
- Sound intensity/loudness – the Doppler effect

21st Century Themes, Skills, and Standards:

CRP2 - Apply appropriate academic and technical skills.
CRP4 - Communicate clearly and effectively and with reason.
CRP8- Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11- Use technology to enhance productivity.

Learning Targets

CPI #	Cumulative Progress Indicators (CPI) for Unit
HSA-SSE.B.3c	Use the properties of exponents to transform expressions for exponential functions.
HSF-IF.C.7e	Graph exponential & logarithmic functions, showing intercepts & end behavior, …
HSF-IF.C.8b	Use the properties of exponents to interpret expressions for exponential functions.
HSF-LE.A.2	Construct … exponential functions, … given … a description of a relationship, or two input-output pairs (include reading these from a table).
HSF-LE.B.5	Interpret the parameters in a … exponential function in terms of a context.
HSF-BF.B.4a	Solve an equation of the form f(x) = c for a simple function *f* that has an inverse & write an expression for the inverse.
HSF-LE.A.4	For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, & d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

HSF-BF.B.3	Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), …, f(x + k) for specific values of k (both positive and negative); … Experiment with cases & illustrate an explanation of the effects on the graph using technology.
HSA-SSE.A.2	Use the structure of an expression to identify ways to rewrite it.
HSA-APR.D.6	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x) …
HSA-APR.D.7	Understand that rational expressions form a system analogous to the rational numbers, closed under …multiplication, and division by a nonzero rational expression; … multiply, and divide rational expressions.
HSA-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
HSA-REI.A.2	Solve simple rational … equations in one variable, & give examples showing how extraneous solutions may arise.

Unit Enduring Questions:

- What are some of the characteristics of the graph of an exponential function?
- What are some of the characteristics of the graph of a logarithmic function?
- How can you transform the graphs of exponential & logarithmic functions?
- How can you use the properties of exponents to derive properties of logarithms?
- How can you solve exponential & logarithmic equations?
- How can you recognize polynomial, exponential, & logarithmic models?
- How can you recognize when two quantities vary directly or inversely?
- What are some of the characteristics of the graph of a rational function?
- How can you determine the excluded values in a product or quotient of two rational expressions?
- How can you determine the domain of the sum or difference of two rational expressions?
- How can you solve a rational equation?

Unit Enduring Understandings:

- Graph exponential growth & decay functions
- Use exponential models to solve real-life problems.
- Define & use the natural base *e*, graph natural base functions.
- Use inverse properties of logarithmic & exponential functions.
- Graph logarithmic functions
- Use the properties of logarithms to evaluate logarithms.
- Use the properties of logarithms to expand or condense logarithmic expressions.
- Use the change-of-base formula to evaluate logarithms.
- Solve exponential & logarithmic equations & inequalities.
- Write exponential functions.
- Use technology to find exponential & logarithmic models.
- Graph rational functions
- Simplify rational expressions.
- Add, subtract, multiply, & divide rational expressions.
- Rewrite rational expressions & graph the related function.
- Simplify complex fractions.
- Solve rational equations (by cross multiplying, by using the least common denominator)
- Use inverses of rational functions.

Unit Objectives: ***Students will know….***	**Unit Objectives:** ***Students will be able to…...***
● How to graph exponential growth & decay functions ● How to use exponential models to solve real-life problems. ● How to define & use the natural base *e*, graph natural base functions ● How to use inverse properties of logarithmic & exponential functions ● How to graph logarithmic functions ● How to transform graphs of logarithmic & exponential functions, write transformations of logarithmic/exponential functions. ● How to use the properties of logarithms to evaluate logarithms ● How to use the properties of logarithms to expand or condense logarithmic expressions ● How to use the change-of-base formula to evaluate logarithms. ● How to solve exponential & logarithmic equations & inequalities ● How to classify data sets ● How to write exponential functions ● How to use technology to find exponential & logarithmic models ● How to classify direct & inverse variation, write inverse variation equations. ● How to graph rational functions, translate simple rational functions. ● How to simplify rational expressions ● How to add, subtract, multiply, & divide rational expressions ● How to rewrite rational expressions & graph the related function. ● How to simplify complex fractions ● How to solve rational equations (by cross multiplying, by using the least common denominator) ● How to use inverses of rational functions	● Graph exponential growth & decay functions ● Use exponential models to solve real-life problems. ● Define & use the natural base *e*, graph natural base functions. ● Use inverse properties of logarithmic & exponential functions. ● Graph logarithmic functions ● Transform graphs of logarithmic & exponential functions, write transformations of logarithmic/exponential functions. ● Use the properties of logarithms to evaluate logarithms. ● Use the properties of logarithms to expand or condense logarithmic expressions. ● Use the change-of-base formula to evaluate logarithms. ● Solve exponential & logarithmic equations & inequalities. ● Classify data sets. ● Write exponential functions. ● Use technology to find exponential & logarithmic models. ● Classify direct & inverse variation, write inverse variation equations. ● Graph rational functions, translate simple rational functions. ● Simplify rational expressions. ● Add, subtract, multiply, & divide rational expressions. ● Rewrite rational expressions & graph the related function. ● Simplify complex fractions. ● Solve rational equations (by cross multiplying, by using the least common denominator) ● Use inverses of rational functions.

Lower Cape May Regional School District - ALGEBRA II Curriculum
Unit 4 Overview

Content Area: Mathematics

Unit Title: Matrices

Target Course/Grade Level: 9 – 12

Unit Summary:

In Unit 4:

- Write the augmented matrix for a linear system
- Perform matrix row operations
- Use matrices & Gaussian elimination to solve systems
- Use matrices & Gauss Jordan elimination to solve systems

Interdisciplinary Connections:

- Computer graphics & image processing
- Business – to predict model changes based on changes made to variables
- Represent real-world data like population, infant mortality rate, etc. (Statistics)
- Scientific studies & research

21st Century Themes, Skills, and Standards:

CRP2 - Apply appropriate academic and technical skills.
CRP4 - Communicate clearly and effectively and with reason.
CRP8- Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11- Use technology to enhance productivity.

Learning Targets	
CPI #	**Cumulative Progress Indicators (CPI) for Unit**
HSN-VN.C.6	Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.
HSN-VN.C.7	Multiply matrices by scalars to produce new matrices, e.g., as when all the payoffs in a game are doubled.
HSN-VN.C.8	Add, subtract, and multiply matrices of appropriate dimensions.
HSN-VN.C.9	Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
HSN-VN.C.10	Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
HSN-VN.C.11	Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
HSN-VN.C.	Work with 2×2 matrices as a transformation of the plane, and interpret the absolute value of the determinant in terms of area.

Unit Enduring Questions:	**Unit Enduring Understandings:**
● What are matrices & their components? ● How do you perform matrix row operations? ● How do you add & subtract matrices? ● How do you find the product of a scalar & a matrix? ● How do you find the product of two matrices? ● How do you find the determinant of a square matrix? ● How can you solve systems of equations using inverses of matrices? ● How can you write the augmented matrix for a linear system? ● How can you use matrices & Gaussian elimination to solve systems? ● How can you use matrices & Gauss Jordan elimination to solve systems?	● Learn & apply matrix terminology ● Perform matrix row operations ● Find sums & differences of matrices & products of a scalar & a matrix ● Find the product of two matrices ● Solve problems using matrices ● Find the determinant of a square matrix ● Solve systems of equations using inverses of matrices ● Use matrices and Gaussian elimination to solve systems. ● Use matrices and Gauss Jordan elimination to solve systems.
Unit Objectives: ***Students will know….*** ● What a matrix is, matrix terminology ● How to perform matrix row operations ● How to find sums & differences of matrices & products of a scalar & a matrix ● How to find the product of two matrices ● How to solve problems using matrices ● How to find the determinant of a square matrix ● How to solve systems of equations using inverses of matrices ● How to use matrices and Gaussian elimination to solve systems. ● How to use matrices and Gauss Jordan elimination to solve systems.	**Unit Objectives:** ***Students will be able to…...*** ● Recite & apply matrix terminology. ● Perform matrix row operations. ● Find sums & differences of matrices & products of a scalar & a matrix. ● Find the product of two matrices. ● Solve problems using matrices. ● Find the determinant of a square matrix. ● Solve systems of equations using inverses of matrices. ● Use matrices and Gaussian elimination to solve systems. ● Use matrices and Gauss Jordan elimination to solve systems.

Lower Cape May Regional School District - ALGEBRA II Curriculum
Evidence of Learning

Specific Formative Assessments Utilized in Daily Lessons:

- Misconception check, warm-up, student conference, observation, self-assessment, quiz, Think-Pair-Share/Turn to Your Partner, oral questioning
- Big Ideas assessments

Summative Assessment Utilized throughout Units:

- QBA's
- Benchmarks: Big Ideas Quizzes & Tests, Big Ideas online assessments

Modifications for ELL's, Special Education, 504, and Gifted and Talented Students:

Teacher tutoring
Peer tutoring
Cooperative Learning Groups
Modified Assignments
Differentiated Instruction
Response to Intervention (www.help4teachers.com)
Follow all IEP and 504 modifications

Teacher Notes:

- As required by the NJ Department of Education, teachers in all content areas will integrate the 21st Century Life and Careers Standards. As the NJDOE indicates, "Providing New Jersey students with the life and career skills needed to function optimally within this dynamic context is a critical focus and organizing principle of K-12 public education. New Jersey has both an obligation to prepare its young people to thrive in this environment, and a vested economic interest in grooming an engaged citizenry made up of productive members of a global workforce that rewards innovation, creativity, and adaptation to change." The links below indicate the CPIs for grade ranges and need to be addressed throughout the units of study:

  Life and Career Standards

- As indicated in the NJSLS, standards and interdisciplinary connections will be integrated throughout content area curriculum. Links to relevant content standards can be found below:

HSA.SSE.A.1, HSA.SSE.A.2, HSA.SSE.B.3, HSA.SSE.B.4, HSA.APR.A.1, HSA.APR.B.2, HSA.APR.B.3, HSA.APR.C.4, HSA.APR.C.5, HSA.APR.D.6, HSA.APR.D.7, HSA.CED.A.1, HSA.CED.A.2, HSA.CED.A.3, HSA.CED.A.4, HSA.REI.A.1, HSA.REI.A.2, HSA.REI.B.3, HSA.REI.B.4, HSA.REI.C.5, HSA.REI.C.6, HSA.REI.C.7, HSA.REI.C.8, HSA.REI.C.9, HSA.REI.D.10, HSA.REI.D.11, HSA.REI.D.12, HSF.IF.A.1, HSF.IF.A.2, HSF.IF.A.3, HSF.IF.B.4, HSF.IF.B.5, HSF.IF.B.6, HSF.IF.C.7, HSF.IF.C.8, HSF.IF.C.9, HSF.BF.A.1, HSF.BF.A.2, HSF.BF.B.3, HSF.BF.B.4, HSF.BF.B.5, HSF.LE.A.1, HSF.LE.A.2, HSF.LE.A.3, HSF.LE.A.4, HSF.LE.B.5, HSF.TF.A.1, HSF.TF.A.1, HSF.TF.A.2, HSF.TF.A.3, HSF.TF.A.4, HSF.TF.B.5, HSF.TF.B.6, HSF.TF.B.7, HSF.TF.C.8, HSF.TF.C.9, HSS.ID.A.1, HSS.ID.A.2, HSS.ID.A.3, HSS.ID.A.4, HSS.ID.B.5, HSS.ID.B.6, HSS.ID.C.7, HSS.ID.C.8, HSS.ID.C.9, HSS.IC.A.1, HSS.IC.A.2, HSS.IC.B.3, HSS.IC.B.3, HSS.IC.B.4, HSS.IC.B.5, HSS.IC.B.6, HSS.CP.A.1, HSS.CP.A.2, HSS.CP.A.3, HSS.CP.A.4, HSS.CP.A.5, HSS.CP.B.6, HSS.CP.B.7, HSS.CP.B.8, HSS.CP.B.9, HSS.MD.A.1, HSS.MD.A.2, HSS.MD.A.3, HSS.MD.A.4, HSS.MD.B.5, HSS.MD.B.6, HSS.MD.B.7

http://www.corestandards.org/Math/

Project-based Learning Tasks:

- Several will be utilized throughout the curriculum - provided by Big Ideas curriculum, as well as original tasks created by the teacher

Vocabulary:

- In-text vocabulary should be incorporated into every unit. Word journals, vocabulary walls, and/or various other activities should be utilized by the instructor to teach vocabulary.

The Research Process:

- The research process must be integrated within each course curriculum. Student will be provided with opportunities to investigate issues from thematic units of study. As the NJSLS indicate, students will develop proficiency with MLA or APA format as applicable.

Technology:

- Students must engage in technology applications integrated throughout the curriculum.

Applicable technology utilized in this curriculum are included below:
Ti-83 Calculators
Desmos
Big Ideas
Khan Academy
YouTube

Resources:

- Ancillary resources and materials used to deliver instruction are included below:

Various technology & math websites
Supplemental material created by the teacher as needed

Differentiation Strategies

Differentiation strategies can require varied amounts of preparation time. High-prep strategies often require a teacher to both create multiple pathways to process information/demonstrate learning and to assign students to those pathways. Hence, more ongoing monitoring and assessment is often required. In contrast, low-prep strategies might require a teacher to strategically create process and product choices for students, but students are allowed to choose which option to pursue given their learning profile or readiness level. Also, a low-prep strategy might be focused on a discrete skill (such as vocabulary words), so there are fewer details to consider. Most teachers find that integration of one to two new low-prep strategies and one high-prep strategy each quarter is a reasonable goal.

Low Prep Strategies (add to list as needed)	
Varied journal prompts, spelling or vocabulary lists	Students are given a choice of different journal prompts, spelling lists or vocabulary lists depending on level of proficiency/assessment results.
Anchor activities	Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.
Choices of books	Different textbooks or novels (often at different levels) that students are allowed to choose from for content study or for literature circles.
Choices of review activities	Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
Homework options	Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.

Student-teacher goal setting	The teacher and student work together to develop individual learning goals for the student.
Flexible grouping	Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individual. Any small groups or pairs change over time based on assessment data.
Varied computer programs	The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
Multiple Intelligence or Learning Style options	Students select activities or are assigned an activity that is designed for learning a specific area of content through their strong intelligence (verbal-linguistic, interpersonal, musical, etc.)
Varying scaffolding of same organizer	Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.
Think-Pair-Share by readiness, interest, and/or learning profile	Students are placed in predetermined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
Mini workshops to re-teach or extend skills	A short, specific lesson with a student or group of students that focuses on one area of interest or reinforcement of a specific skill.
Orbitals	Students conduct independent investigations generally lasting 3-6 weeks. The investigations "orbit" or revolve around some facet of the curriculum.
Games to practice mastery of information and skill	Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.

Multiple levels of questions	Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
High Prep Strategies (add to list as needed)	
Cubing	Designed to help students think about a topic or idea from many different angles or perspectives. The tasks are placed on the six sides of a cube and use commands that help support thinking (justify, describe, evaluate, connect, etc.). The students complete the task on the side that ends face up, either independently or in homogenous groups.
Tiered assignment/ product	The content and objective are the same, but the process and/or the products that students must create to demonstrate mastery are varied according to the students' readiness level.
Independent studies	Students choose a topic of interest that they are curious about and wants to discover new information on. Research is done from questions developed by the student and/or teacher. The researcher produces a product to share learning with classmates.
4MAT	Teachers plan instruction for each of four learning preferences over the course of several days on a given topic. Some lessons focus on mastery, some on understanding, some on personal involvement, and some on synthesis. Each learner has a chance to approach the topic through preferred modes and to strengthen weaker areas

Jigsaw	Students are grouped based on their reading proficiency and each group is given an appropriate text on a specific aspect of a topic (the economic, political, and social impact of the Civil War, for example). Students later get into heterogeneous groups to share their findings with their peers, who have read about different areas of study from source texts on their own reading levels. The jigsaw technique allows you to tackle the same subject with all of your students while discreetly providing them the different tools they need to get there.
Multiple texts	The teacher obtains or creates a variety of texts at different reading levels to assign strategically to students.
Alternative assessments	After completing a learning experience via the same content or process, the student may have a choice of products to show what has been learned. This differentiation creates possibilities for students who excel in different modalities over others (verbal versus visual).
Modified Assessments	Assessments can be modified in a variety of ways – for example by formatting the document differently (e.g., more space between questions) or by using different types of questions (matching vs. open ended) or by asking only the truly essential questions.
Learning contracts or Personal Agendas	A contract is a negotiated agreement between teacher and student that may have a mix of requirements and choice based on skills and understandings considered important by the teacher. A personal agenda could be quite similar, as it would list the tasks the teacher wants each student to accomplish in each day/lesson/unit. Both Learning contracts and personal agendas will likely vary between students within a classroom.
Compacting	This strategy begins with a student assessment to determine level of knowledge or skill already attained (i.e., pretest). Students who demonstrate proficiency before the unit even begins are given the opportunity to work at a higher level (either independently or in a group).

Literature circles	Flexible grouping of students who engage in different studies of a piece of literature. Groups can be heterogeneous and homogeneous.
Learning Centers	A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individual or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.
Tic-Tac-Toe Choice Board (sometimes called "Think-Tac-Toe"	The tic-tac-toe choice board is a strategy that enables students to choose multiple tasks to practice a skill or demonstrate and extend understanding of a process or concept. From the board, students choose (or teacher assigns) three adjacent or diagonal. To design a tic-tac-toe board: - Identify the outcomes and instructional focus - Design 9 different tasks - Use assessment data to determine student levels - Arrange the tasks on a tic-tac-toe board either randomly, in rows according to level of difficulty, or you may want to select one critical task to place in the center of the board for all students to complete.

Curriculum development Resources/Instructional Materials:

List or Link Ancillary Resources and Curriculum Materials Here:

- Big Ideas
- Various technology & math websites
- Supplemental material created by the teacher as needed

Board of Education Approved Text(s)

- Big Ideas Math - Algebra 2