



PASSAIC COUNTY TECHNICAL INSTITUTE
45 Reinhardt Road
Wayne, NJ

Applications of Algebra II Curriculum
Course # 0322
5 Credits
2017

I. Course Description

Building on the understanding of linear, quadratic, trigonometric and exponential functions from Algebra I, this course will extend function concepts to include polynomial, rational, and radical functions. The standards in this course continue the work of modeling situations and solving equations.

II. PCTI Curriculum Unit Planner

Unit 1

Content Area:	Algebra II	Grade(s)	9, 10, & 11
Unit Plan Title:	Unit 1 – Polynomials <i>Unit 1 will extend student’s algebra knowledge of polynomials. Standard will continue with factoring, solving and graphing polynomials, focusing on transformations of graphs.</i> I. POLYNOMIALS (32 days) <ol style="list-style-type: none">1. Performing Arithmetic Operations with Complex Numbers2. Solve quadratic equations3. Graph Quadratic Functions in Standard, Vertex, and Intercept Form4. Performing Arithmetic Operations with Polynomials5. Remainder and Factor Theorem6. Factoring Polynomials7. Fundamental Theorem of Algebra8. Interpret Key Features of Polynomial Graphs		
NJSLS Standard(s) Addressed in this unit			
A-REI.B.4. Solve quadratic equations in one variable. A-REI.B.4.a. 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.B.4.b. Solve quadratic equations by inspection (e.g., for $x^2=49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b . N-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 and b real.			

N-CN.A.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

N-CN.C.7. Solve quadratic equations with real coefficients that have complex solutions.

A-SSE.B.3.a. Factor a quadratic expression to reveal the zeros of the function it defines.

F-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.*

F-IF.C.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*

F-IF.C.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

F-IF.C.7.b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

A-APR.A.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

A-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 $p(x)$.

A-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.

A-APR.C.4. Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.

A-SSE.A.1. Interpret expressions that represent a quantity in terms of its context.*

A-SSE.A.1.a. Interpret parts of an expression, such as terms, factors, and coefficients.

A-APR.B.4. 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-SSE.B.3. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.*

Essential Questions (3-5)

1. How can polynomials be simplified and applied to solve problems?
2. Can two algebraic expressions that appear to be different be equivalent?
3. How are the properties of real numbers related to polynomials?
4. How do polynomial functions model real-world problems and their solutions?
5. Why are complex numbers necessary?
6. How are operations and properties of complex numbers related to those of real numbers?

Anchor Text

Algebra II Larson, Common Core Edition

Authors : Ron Larson

Houghton Mifflin Harcourt

Copyrite Date: 2012

ISBN: 978-0-547-64715-9

Algebra II Burger, Common Core Edition

Authors : Burger

Houghton Mifflin Harcourt

Copyrite Date: 2012

ISBN: 978-0-547-64707-4

Formative & Summative Assessments

Formative Assessment

- Homework
- Quiz
- Chapter test
- Classwork

Summative Assessment

- Marking Period Pre Test
- Marking Period Post Test
- Project
- Final Exam

Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

TI 84 Plus Calculator

TI Nspire Graphing Calculator

Excel

Canvas

Google Classroom

I.1. Performing Arithmetic Operations with Complex Numbers

<http://www.purplemath.com/modules/complex2.htm>

<http://www.youtube.com/watch?v=MEuPzvh0roM>

I.2. Solve quadratic equations

http://www.webgraphing.com/quadraticcequation_completingthesquare.jsp

https://www.khanacademy.org/math/algebra/quadratics/completing_the_square/v/solving-quadratic-equations-by-square-roots

https://www.khanacademy.org/math/algebra/quadratics/quadratic_formula/v/using-the-quadratic-formula

http://www.webgraphing.com/quadraticcequation_quadraticformula.jsp

<http://www.mathplanet.com/education/algebra-1/exponents-and-exponential-functions/properties-of-exponents>

I.3. Graph Quadratic Functions in Standard, Vertex, and Intercept Form

<https://www.desmos.com/calculator>

<http://www.youtube.com/watch?v=y99lNRqLjBA>

<http://vimeo.com/47178923>

I.4. Performing Arithmetic Operations with Polynomials

<http://www.virtualnerd.com/algebra-1/polynomials-and-factoring/add-subtract/>

<http://www.virtualnerd.com/algebra-1/polynomials-and-factoring/multiply-divide/>

I.5. Use the remainder and factor theorems

<http://www.virtualnerd.com/algebra-1/polynomials-and-factoring/factoring-strategy-solving-equations/choosing-strategy-grouping/>
<http://www.youtube.com/watch?v=IPqCaspZOo>

I.6. Factoring Polynomials

<http://www.virtualnerd.com/algebra-1/polynomials-and-factoring/factoring-strategy-solving-equations/solving-equations/>
<http://www.virtualnerd.com/algebra-1/polynomials-and-factoring/factoring-strategy-solving-equations/choosing-strategy-grouping/>

I.7. Fundamental Theorem of Algebra

<http://www.mathsisfun.com/algebra/fundamental-theorem-algebra.html>
<http://www.youtube.com/watch?v=ox3zyPKRnlM>

I.8. Interpret key features of polynomial graphs

http://www.youtube.com/watch?v=Vl4pBa_XroE
<http://www.youtube.com/watch?v=-LJ5Bt8UwCo>

Suggested Time Frame:	45 Days
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Unit 2

Content Area:	Algebra II	Grade(s)	9, 10, & 11
Unit Plan Title:	<p>Unit 2 – Inverse Functions & Trigonometry</p> <p><i>Unit 2 standards will build on the students' previous knowledge of functions, investigate inverse functions, using compositions, trigonometric ratios and circles in geometry to extend trigonometry to model periodic phenomena. Standard will continue with analyzation of trigonometric identities.</i></p> <p>II. INVERSE FUNCTIONS AND FUNCTION SYSTEMS (12 days)</p> <ol style="list-style-type: none"> 1. Perform Function Composition 2. Determine the inverse function for a simple function <p>Solve systems of linear and quadratic equation in two variables, algebraically and graphically.</p> <p>III. TRIGONOMETRIC RATIOS AND FUNCTIONS (45 days)</p> <ol style="list-style-type: none"> 1. Evaluate coterminal and reference angle 2. Convert angle measurement between radians and degrees 3. Identify degree and radian angle measurements and coordinates of the unit circle 4. Evaluate trigonometric functions using the unit circle 		

5. Evaluate inverse of sine, cosine and tangent functions
6. Interpret key features and sketch the graphs of the six trigonometric functions
7. Use the fundamental trigonometric identities to simplify and rewrite expressions and to verify other identities
8. Solve trigonometric identities

NJSLS Standard(s) Addressed in this unit

F-BF.B.4. Find inverse functions.

F-BF.B.4.a. 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.B.4.b. Verify by composition that one function is the inverse of another.

F-BF.B.4.c. Read values of an inverse function from a graph or a table, given that the function has an inverse.

F-BF.B.4.d. Produce an invertible function from a non-invertible function by restricting the domain.

A-REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A-REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

F-TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

F-TF.A.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

F-TF.A.2. 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.A.4. Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

F-IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example if the function $h(n)$ gives the number of person-hours, it takes to assemble n engines in a factory, then the positive integers would be appropriate domain for the function.

F-TF.B.6. Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

F-TF.B.7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

F-TF.C.8.. (+) Prove the Pythagorean identity $\sin^2 \theta + \cos^2 \theta = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.

Essential Questions (3-5)

1. How can you find the inverse of a relation or function?
2. How can you determine whether the inverse of a function is a function?
3. How can the Unit Circle be used to quickly evaluate inverse trig functions at common points?
4. How can you evaluate inverse trig functions if a point not on the unit circle is included?
5. How do the graphs of the inverse trig functions relate to the parent graphs of the trig functions?

6. How does the unit circle and the concept of conterminal angles help us to generate graphs of trig functions where the y-axis represents the value of the function and the x-axis represents the angle?
7. How can the inverse trig functions be represented with algebraic functions?

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- Quiz
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Summative Assessment

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- Marking Period Post Test
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- Final Exam

Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

TI 84 Plus Calculator
TI Nspire Graphing Calculator
Excel
Canvas
Google Classroom

II.1. Perform Function Composition

http://www.youtube.com/watch?v=LM_NyH4R6yw
http://www.youtube.com/watch?v=G1_0MhsuyO8
<http://www.youtube.com/watch?v=v8JgEEimO7w>

II.2. Determine the inverse function for a simple function

<http://www.youtube.com/watch?v=nSmFzOpXhbY>
<http://www.youtube.com/watch?v=DsaJKV4M-vk>

II.3. Solve systems of linear and quadratic equation in two variables, algebraically and graphically.

<http://www.youtube.com/watch?v=TSRhRbuL7E8>

<http://mathmind.com/PDF%20Files/Algebra%202/chap09/section07/notetaking.pdf>

III.1. Evaluate coterminal and reference angle, III.2. Convert angle measurement between radians and degrees, III.3. Identify degree and radian angle measurements and coordinates of the unit circle, III.4. Evaluate trigonometric functions using the unit circle

<https://www.youtube.com/watch?v=cwL3uktPLEs>

<https://www.youtube.com/watch?v=sw5QNMLpep0>

[13.2 – Define General Angles and Use Radian Measure.ppt](#)

<http://www.youtube.com/watch?v=vlSb74Gk8yc>

<http://www.youtube.com/watch?v=N6Lsib4s5Ak>

http://ceemrr.com/Geometry2/GeneralAngles/GeneralAngles_print.html

[13_2 Notes.doc - Mira Costa High School](#)

<http://www.youtube.com/watch?v=cNjzvnK5QqE>

http://cims.nyu.edu/~kiryl/Precalculus/Section_6.3-

[Trigonometric%20Functions%20of%20Angles/Trigonometric%20Functions%20of%20Angles.pdf">Trigonometric%20Functions%20of%20Angles/Trigonometric%20Functions%20of%20Angles.pdf](#)

<http://www.youtube.com/watch?v=Cg70E506maw>

<http://www.youtube.com/watch?v=zFvxHQtUHRQ>

<http://www.youtube.com/watch?v=sb9oZZeBNhg>

III.6. Interpret key features and sketch the graphs of the six trigonometric functions.

<http://www.mathsisfun.com/algebra/trig-sin-cos-tan-graphs.html>

http://www.analyzemath.com/unitcircle/unit_circle_applet.html

<http://www.youtube.com/watch?v=pxFZCTA19G8>

<http://exchange.smarttech.com/search.html?q=%22Sine%20%20Cosine%22>

<http://youtu.be/yR7y8hyOpDU>

http://youtu.be/c1VD_LEs5ZY

[Translate and Reflect Trigonometric Graphs - Mira Costa High School](#)

[10-2 Translate and Reflect Trigonometric Graphs](#)

<http://youtu.be/CuvO9-Zk2Xc>

<http://youtu.be/0KxVA7NWZiM>

III.5. Evaluate inverse of sine, cosine and tangent functions, III.7. Use the fundamental trigonometric identities to simplify and rewrite expressions and to verify other identities III.8. Solve trigonometric identities

[Proving Trigonometric Identities - Purplemath](#)

[Verifying trigonometric identities - SlideShare](#)

<http://youtu.be/vA6451TpSig>

<http://youtu.be/TCdhf9iVkyC>

<http://youtu.be/q8k-sS7qRts>

<http://youtu.be/mAnw4ImaPK0>

<http://youtu.be/a70-dYvDJZY>

Suggested Time Frame:

45 Days

Unit 3

Content Area:	Algebra II	Grade(s)	9, 10, & 11
Unit Plan Title:	Unit 3 – Rational, Radical, Exponential, and Logarithmic Functions <i>Unit 3 will extend student's algebra knowledge of rational, radical, and exponential functions. Standard will continue with logarithmic functions. The graphs of all the functions in unit 3 will be modeled and their transformations will be analyzed.</i> IV. RATIONAL AND RADICAL FUNCTIONS (27 days) <ol style="list-style-type: none">1. Perform arithmetic operations with Rational Expressions2. Rewrite simple rational expressions in different forms3. Solve Rational Equations4. Interpret key features of simple and general rational graphs5. Use properties of integer exponents to explain and convert between expressions involving radicals and rational exponents, using correct notation.6. Solve Radical Equations7. Interpret key features of Square Root Function and Cube Root graphs V. EXPONENTIAL AND LOGARITHMIC FUNCTIONS (18 days) <ol style="list-style-type: none">1. Use properties of exponents to rewrite a function in an equivalent form to reveal and explain different properties of the exponential function.2. Graph exponential functions expressed symbolically or verbally and show key features of the graph.3. Use Functions Involving e4. Rewriting Exponential Equations in Logarithmic Form5. Apply Properties of Logarithms6. Solve Exponential and Logarithmic Equations7. Interpret key features of Logarithmic Functions graphs		
NJSLS Standard(s) Addressed in this unit			

A-APR.D.6. 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.

A-APR.D.7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

A-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.

A-REI.A.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A-REI.C.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A-REI.C.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

F-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.*

F-BF.B.3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

N-RN.A.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3) \cdot 3}$ to hold, so $(5^{1/3})^3$ must equal 5.

N-RN.A.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

A-SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

F-IF.C.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*

F-IF.C.7.e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

F-IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

F-IF.C.8.b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.

F.LE.A.4. Understanding the inverse relationship between exponents and logarithms. For exponential models, express as a logarithm the solution to $abct = d$ where a , c , and d are numbers and the base b is 2, 10, or e ; evaluate the logarithm using technology.

Essential Questions (3-5)

1. How can you graph rational, radical, exponential, and logarithmic functions?

2. How can you solve rational, radical, exponential, and logarithmic equations?
3. What kinds of asymptotes may exist in rational, radical, exponential, and logarithmic functions and why?
4. Why do rational and radical expressions need to have a defined domain?
5. How do exponential and logarithmic functions model real-world problems and their solutions?
6. How are expressions involving exponents and logarithms related?

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- Project
- Final Exam

Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

TI 84 Plus Calculator

TI Nspire Graphing Calculator

Excel

Canvas

Google Classroom

IV.1. Perform arithmetic operations with Rational Expressions

http://www.youtube.com/watch?v=z4Hssd_oiDQ

<http://www.youtube.com/watch?v=WbvLjmK4Kmc>

<http://www.youtube.com/watch?v=d3xr5a4cln0>

http://www.youtube.com/watch?v=r_mkz0lfQ0o

http://www.youtube.com/watch?v=8_2x1kktEPc

<http://www.youtube.com/watch?v=SyVq0-0bQdA>

IV.2. Rewrite simple rational expressions in different forms using inspection, long division, or, for the more complicated examples, a computer algebra system. **

<https://www.youtube.com/watch?v=-DUMVzvu7-g>

IV.3. Solve Rational Equations

<http://www.youtube.com/watch?v=|kheP|ajfEc>

<http://www.youtube.com/watch?v=f9QBU4v0X2U>

<http://www.youtube.com/watch?v=r9LYqfqsS0>

IV.4. Interpret key features of simple and general rational graphs in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

<https://www.youtube.com/watch?v=-DUMVzvu7-g>

<http://www.purplemath.com/modules/grphrtnl.htm>

IV.5. Use properties of integer exponents to explain and convert between expressions involving radicals and rational exponents, using correct notation.

http://www.youtube.com/watch?v=PpuKD2_OfFk

<http://www.youtube.com/watch?v=NCEB8x-IYBM>

<http://www.youtube.com/watch?v=pafRsMuHNOQ>

<http://www.youtube.com/watch?v=-T1punCdxas>

IV.6. Solve Radical Equations

<http://www.youtube.com/watch?v=hkF8ej72NAg>

<http://www.youtube.com/watch?v=8EOGx68kdwo>

<http://www.youtube.com/watch?v=Ef2gOQbDv7M>

<http://www.youtube.com/watch?v=QCnPNv4mE8g>

IV.7. Interpret key features of Square Root Function and Cube Root graphs in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

<http://www.youtube.com/watch?v=xQ6DTxjUA7w>

<http://www.youtube.com/watch?v=17rEN-fVPvE>

V.1. Use properties of exponents to rewrite a function in an equivalent form to reveal and explain different properties of the exponential function.

<http://www.youtube.com/watch?v=c6pcRR5Uy6w>

http://www.youtube.com/watch?v=4vmR8XMvQ_I

<http://www.youtube.com/watch?v=f-3QDswUc8o>

<http://www.youtube.com/watch?v=sf8KdpN67Sk>

<http://www.youtube.com/watch?v=XJlawwoGhxQ>

V.2. Graph exponential functions expressed symbolically or verbally and show key features of the graph.

<http://www.youtube.com/watch?v=c6pcRR5Uy6w>

http://www.youtube.com/watch?v=4vmR8XMvQ_I

<http://www.youtube.com/watch?v=f-3QDswUc8o>

<http://www.youtube.com/watch?v=sf8KdpN67Sk>

<http://www.youtube.com/watch?v=XJlawwoGhxQ>

V.3. Use Functions Involving e

<http://www.youtube.com/watch?v=SNZgbj3UaRE>

<http://www.youtube.com/watch?v=gvwXYc7Qa9E>

<http://www.youtube.com/watch?v=Yo-UN392NDc>

V.4. Rewriting Exponential Equations in Logarithmic Form

- <https://www.youtube.com/watch?v=fjBZCEZpISQ>
- <http://www.youtube.com/user/learnmathutorials?v=wFYsijcVWYy0>
- <http://www.youtube.com/watch?v=REPqXHu7gXc&feature=c4-overview-vl&list=PLBFAE01DF8EA66352>
- <http://www.youtube.com/watch?v=mUfXkwTQB8o&feature=c4-overview-vl&list=PLBFAE01DF8EA66352>
- <http://www.youtube.com/watch?v=Fo0pciptGWs>

V.5. Apply Properties of Logarithms

- <http://www.youtube.com/watch?v=eLapHtvQbFo>
- <http://www.youtube.com/watch?v=kXYbrOjm9D8>
- http://www.youtube.com/watch?v=dLJAuL_dveQ

V.6. Solve Exponential and Logarithmic Equations

- <http://www.youtube.com/watch?v=CqYDBfoiwOc>
- <http://www.youtube.com/watch?v=QMesv6cJxtI>
- <http://www.youtube.com/watch?v=Fo0pciptGWs>

V.7. Interpret key features of Logarithmic Functions graphs in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

- <https://www.youtube.com/watch?v=fjBZCEZpISQ>
- <http://www.youtube.com/user/learnmathutorials?v=wFYsijcVWYy0>
- <http://www.youtube.com/watch?v=REPqXHu7gXc&feature=c4-overview-vl&list=PLBFAE01DF8EA66352>
- <http://www.youtube.com/watch?v=mUfXkwTQB8o&feature=c4-overview-vl&list=PLBFAE01DF8EA66352>
- <http://www.youtube.com/watch?v=Fo0pciptGWs>

Suggested Time Frame:	45 Days
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Unit 4

Content Area:	Algebra II	Grade(s)	9, 10, & 11
Unit Plan Title:	Unit 4 – Inverse Functions, Sequences, Series, and Data & Statistics <i>Unit 4 will study relation and visual displays and summary statistics learned in prior courses to different types of data and to probability distributions. Samples, surveys, experiments and simulations will be used as methods to collect data.</i> VI. SEQUENCE AND SERIES (22 days) <ol style="list-style-type: none"> 1. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. 2. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the 		

formula to solve problems. For example, calculate mortgage payments. ‘

VII. ANALYZE DATA AND STATISTICS (22 days)

1. Identify different methods and purposes for conducting sample surveys, experiments, and observational studies and explain how randomization relates to each. **
2. Use data from a randomized experiment to compare two treatments and use simulations to decide if differences between parameters are significant; evaluate reports based on data. **

NJSLS Standard(s) Addressed in this unit

A-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.*

F-BF.A.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

A-SSE.B.4. Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.*

S-IC.B.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S-IC.B.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

S-IC.B.6. Evaluate reports based on data.

Essential Questions (3-5)

1. Why is a sequence a function?
2. How can you write a rule for an arithmetic sequence?
3. How can you write a rule for a geometric sequence?
4. How can you use sequences and series to solve real life problems?
5. How can one differentiate between the three types of probability?
6. What is conditional probability?
7. How can one determine if two events will occur in sequence?
8. How can one determine if two events are mutually exclusive?

Anchor Text

Algebra II Larson, Common Core Edition

Authors : Ron Larson

Houghton Mifflin Harcourt

Copyrite Date: 2012

ISBN: 978-0-547-64715-9

Algebra II Burger, Common Core Edition

Authors : Burger

Houghton Mifflin Harcourt

Copyrite Date: 2012

ISBN: 978-0-547-64707-4

Formative & Summative Assessments

Formative Assessment

- Homework
- Quiz
- Chapter test
- Classwork

Summative Assessment

- Marking Period Pre Test
- Marking Period Post Test
- Project
- Final Exam

Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

TI 84 Plus Calculator

TI Nspire Graphing Calculator

Excel

Canvas

Google Classroom

VI.1. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

<http://mathmind.com/PDF%20Files/Algebra%202/chap10/section01/notetaking.pdf>

<http://www.virtualnerd.com/algebra-2/sequences-series>

<http://www.youtube.com/watch?v=oDQmXsXzNn0>

http://www.youtube.com/watch?v=W561_exZn2k

http://www.youtube.com/watch?v=lj_X9JVSF8k

<http://prezi.com/htshzbfuhzyi/122-analyze-arithmetic-sequences-and-series/>

<http://www.youtube.com/watch?v=rtsk8caxbr4>

<http://www.virtualnerd.com/algebra-2/sequences-series/geometric/geometric-sequences>

<http://www.youtube.com/watch?v=k-ygvxR47Fc>

<http://www.youtube.com/watch?v=NEZuM5itx7o>

<http://www.youtube.com/watch?v=y6Qlro3Cdig>

<http://www.youtube.com/watch?v=-XVIMMjtAmI>

VI.2. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.

<http://www.youtube.com/watch?v=i6zeKlXYgE8>

<http://www.youtube.com/watch?v=mcnblnEsf98>

<http://www.youtube.com/watch?v=Ocd1iQyN-qk>

VII.1. Identify different methods and purposes for conducting sample surveys, experiments, and observational studies and explain how randomization relates to each. **

<http://www.slideserve.com/kiet/7-5-purple-select-and-draw-conclusions-from-samples>

[Download 6.4-Select and Draw Conclusions](#)

[Lesson 14.4A Drawing Conclusions from Samples, Surveys - CORD ...](#)

[7.5 select and draw conclusions from samples](#)

<http://www.youtube.com/watch?v=wnNapKDGQH4>

VII.2. Use data from a randomized experiment to compare two treatments and use simulations to decide if differences between parameters are significant; evaluate reports based on data. **

<http://www.slideserve.com/kiet/7-5-purple-select-and-draw-conclusions-from-samples>

[Download 6.4-Select and Draw Conclusions](#)

[Lesson 14.4A Drawing Conclusions from Samples, Surveys - CORD ...](#)

[7.5 select and draw conclusions from samples](#)

<http://www.youtube.com/watch?v=wnNapKDGQH4>

Suggested Time Frame:

45 Days

III. Instructional Strategies

- Lecture
- Graphs and other visuals
- Student investigative activities
- Engaging in discussions
- Reading silently and aloud
- Brainstorming
- Listening
- Participating in small and large groups
- Collaborative projects
- Answering questions (oral and written)
- Summarizing
- Debating
- Analyzing data, discussions, etc.
- Peer teaching
- Playing games

- Note taking
- Writing

Differentiated Instruction

- Students will work individually, engage in cooperative learning, and utilize discovery learning on certain activities. Through the use of lectures, the internet, and interactive whiteboards, students will be exposed to various teaching methods to appeal to visual, auditory, and kinesthetic learners. Students will be given copies of data sets and other important notes.

VI. Methods of Student Evaluation

Assessment can be divided into two general categories: formal (graded) and informal/classroom-based (both graded and ungraded). The key to effectively assessing a student's mastery of skills is to match the assessment method to the learning objective.

Formal Assessments

- Homework and classwork assignments
- Reports and presentations
- Technological applications
- Multiple choice assessment
- Quizzes
- Projects
- Short answer and problem solving assessment
- Tests
- Investigative task

Informal Assessments

- Instructor's observations of note-taking, and organization of notebooks and assignments
- Class Participation
- Cooperative learning activities
- Observing citizenship and appropriate social responses
- Instructor's observations of time management skills

V. Scope and Sequence

Key: I – Introduced, D-developed in Depth, R-Reinforced

Skill/Concepts to be Learned	9	10	11
Find the line of symmetry and vertex of a parabola given its function rule.	IDR	IDR	IDR
Find real solutions for quadratic equations using different methods.	IDR	IDR	IDR
Represent complex numbers in the form $a + bi$ or in the complex plane.	IDR	IDR	IDR
Represent square roots of negative numbers as multiples of i .	IDR	IDR	IDR
Perform addition, subtraction, and multiplication of complex numbers.	IDR	IDR	IDR
Find the inverse of a function.	IDR	IDR	IDR
Use composition to verify that functions are inverses.	IDR	IDR	IDR
Determine angles that are coterminal.	IDR	IDR	IDR
Identify characteristics of angles in standard position.	IDR	IDR	IDR
Convert between degree and radian measure.	IDR	IDR	IDR
Compare sine, cosine, and tangent values for angles having the same reference angle.	IDR	IDR	IDR
Find the sine, cosine, and tangent values of angle measures using the unit circle.	IDR	IDR	IDR
Evaluate the six trigonometric functions for special angles.	IDR	IDR	IDR
Solve right triangle trigonometry problems involving reciprocal trigonometric functions.	IDR	IDR	IDR
Evaluate the six trigonometric functions for angles in degrees or radians based on one or more given trigonometric function values.	IDR	IDR	IDR
Evaluate inverse trigonometric functions over a specified domain.	IDR	IDR	IDR

Solve trigonometric equations over a specified domain.	IDR	IDR	IDR
Evaluate numeric expressions using laws of integer exponents.	IDR	IDR	IDR
Simplify single-variable expressions using laws of integer exponents.	IDR	IDR	IDR
Simplify single-variable expressions using laws of integer exponents.	IDR	IDR	IDR
Simplify rational expressions using factoring techniques.	IDR	IDR	IDR
Determine excluded values of rational expressions.	IDR	IDR	IDR
Simplify rational expressions using factoring techniques.	IDR	IDR	IDR
Perform multiplication and division of rational expressions.	IDR	IDR	IDR
Perform addition and subtraction of rational expressions.	IDR	IDR	IDR
Simplify complex rational expressions containing sums or differences.	IDR	IDR	IDR
Solve rational equations and determine extraneous solutions.	IDR	IDR	IDR
Determine the horizontal and vertical asymptotes and holes in the graph of a rational function having the x-axis as its only horizontal asymptote.	IDR	IDR	IDR
Solve problems involving inverse variation.	IDR	IDR	IDR
Determine the domain and range of square root and cube root functions.	IDR	IDR	IDR
Relate transformations to the graphs of square root and cube root functions to their parent function.	IDR	IDR	IDR
Evaluate numeric expressions using properties of rational exponents.	IDR	IDR	IDR
Simplify algebraic expressions using properties of rational exponents.	IDR	IDR	IDR
Add and subtract radical expressions.	IDR	IDR	IDR
Identify like radicals.	IDR	IDR	IDR
Perform multiplication of radical expressions.	IDR	IDR	IDR

Perform division of radical expressions, rationalizing the denominator when necessary.	IDR	IDR	IDR
Solve equations containing two radicals, and determine extraneous solutions.	IDR	IDR	IDR
Determine the domain and range of logarithmic and exponential functions.	IDR	IDR	IDR
Graph logarithmic and exponential functions.	IDR	IDR	IDR
Solve logarithmic and exponential equations	IDR	IDR	IDR
Solve logarithmic equations by converting between logarithmic and exponential forms.	IDR	IDR	IDR
Evaluate, expand, and simplify logarithmic expressions using properties of logarithms.	IDR	IDR	IDR
Apply properties of logarithms to solve logarithmic equations.	IDR	IDR	IDR
Determine extraneous solutions of logarithmic equations.	IDR	IDR	IDR
Solve exponential and logarithmic equations using inverses, properties, and algorithms.	IDR	IDR	IDR
Write arithmetic and geometric sequences both recursively and with an explicit formula	IDR	IDR	IDR
Derive the formula for the sum of a finite geometric series	IDR	IDR	IDR
Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	IDR	IDR	IDR
Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	IDR	IDR	IDR
Evaluate reports based on data.	IDR	IDR	IDR

VI. Textbooks, Instructional Resources and Software

Algebra II Larson, Common Core Edition Authors : Ron Larson and Algebra II Burger, Common Core Edition Authors : Burger

Resources for Students	Resources for Teachers
<p>Digital</p> <p>Companion website: https://my.hrw.com/</p> <p>Practice and Resources</p> <ul style="list-style-type: none">• Interactive Practice Test• Chapter Review Games• Chapter Project• Measurement and Data Handbook• Multi-Language Visual Glossary• Interactive Practice Quiz• Problem Solving Workshop• Study Guide• Investigating Geometry Activity• Real-Life Application <p>Internet Resources</p> <ul style="list-style-type: none">• Multilingual Glossary• Graphing Calculator• Scientific Calculator• Online Student Edition <p>Print</p> <p>Student Edition ISBN: 978-0-547-64714-2</p>	<p>Digital</p> <p>Companion website: https://my.hrw.com/</p> <p>Resources</p> <ul style="list-style-type: none">• Lesson Plans• Teaching Guide• Solutions Key• Quick Catch-Up for Absent Students• Lesson Transparencies• PowerPoint Presentations• Study Guide• Tiered Student Practice• Chapter Project: Answers and Teacher’s Notes <p>Assessment Resources</p> <ul style="list-style-type: none">• Quizzes, Chapter Tests• Standardized Chapter Test• SAT/ACT Chapter Test• Alternative Assessment• Cumulative Test• End-of-Course Test• Remediation Book• Skills Readiness <p>Internet Resources</p> <ul style="list-style-type: none">• Multilingual Glossary• Graphing/Scientific Calculator• Online Teacher Edition <p>Print</p> <p>Annotated Instructor’s Edition ISBN: 978-0-547-64708-1</p>

VII. Algebra II Curriculum Correlation Chart with Textbook

Algebra II Topic	Corresponding Text Sections	
	Larson Book	Burger Book
I. POLYNOMIALS		
1. Performing Arithmetic Operations with Complex Numbers	1.6	2.9
2. Solve quadratic equations	1.7, 1.8	2.3, 2.4, 2.6
3. Graph Quadratic Functions in Standard, Vertex, and Intercept Form	1.2	2.1
4. Performing Arithmetic Operations with Polynomials	2.3	3.1-3.2
5. Remainder and Factor Theorem	2.5	3.3, 3.4
6. Factoring Polynomials	2.4	3.4
7. Fundamental Theorem of Algebra	2.7	3.6
8. Interpret Key Features of Polynomial Graphs	2.2, 2.8	3.7
II. INVERSE FUNCTIONS AND FUNCTION SYSTEMS		
1. Perform Function Composition	3.3	6.5
2. Determine the inverse function for a simple function	3.4	6.6
3. Solve systems of linear and quadratic equation in two variables, algebraically and graphically.	8.7	12.7
III. TRIGONOMETRIC RATIOS AND FUNCTIONS		
1. Evaluate coterminal and reference angle	9.2-9.3	10.2
2. Convert angle measurement between radians and degrees	9.2	10.3
3. Identify degree and radian angle measurements and coordinates of the unit circle	9.2	10.3
4. Evaluate trigonometric functions using the unit circle	9.2	10.3
5. Evaluate inverse of sine, cosine and tangent functions	9.4	10.4
6. Interpret key features and sketch the graphs of the six trigonometric functions	10.1-10.2	11.1-11.2
7. Use the fundamental trigonometric identities to simplify and rewrite expressions and to verify other identities	10.3	11.3
8. Solve trigonometric identities	10.4	11.6
IV. RATIONAL AND RADICAL FUNCTIONS		
1. Perform arithmetic operations with Rational Expressions	5.4, 5.5	5.2, 5.3

2. Rewrite simple rational expressions in different forms	5.2 Ext	
3. Solve Rational Equations	5.6	5.5
4. Interpret key features of simple and general rational graphs	5.2, 5.3	5.4
5. Use properties of integer exponents to explain and convert between expressions involving radicals and rational exponents, using correct notation.	3.1, 3.2	5.6
6. Solve Radical Equations	3.6	5.8
7. Interpret key features of Square Root Function and Cube Root graphs	3.5	5.7

V. EXPONENTIAL AND LOGARITHMIC FUNCTIONS

1. Use properties of exponents to rewrite a function in an equivalent form to reveal and explain different properties of the exponential function.	4.1, 4.2	4.1
2. Graph exponential functions expressed symbolically or verbally and show key features of the graph.	4.1, 4.2	4.1
3. Use Functions Involving e	4.3	4.6
4. Rewriting Exponential Equations in Logarithmic Form	4.4	4.3
5. Apply Properties of Logarithms	4.5	4.4
6. Solve Exponential and Logarithmic Equations	4.6	4.5-4.6
7. Interpret key features of Logarithmic Functions graphs	4.4	4.7
8. Use properties of exponents to rewrite a function in an equivalent form to reveal and explain different properties of the exponential function.	4.1, 4.2	4.1

VI. SEQUENCE AND SERIES

1. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	7.1-7.3, 7.5	9.1-9.4
2. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.	7.4	9.5

VII. ANALYZE DATA AND STATISTICS

1. Identify different methods and purposes for conducting sample surveys, experiments, and observational studies and explain how randomization relates to each. **	6.4-6.5	8.2
2. Use data from a randomized experiment to compare two treatments and use simulations to decide if differences between parameters are significant; evaluate reports based on data. **	6.5 EXT	8.3

VIII. Student Handout

Algebra II Course Overview

Building on the understanding of linear, quadratic, trigonometric and exponential functions from Algebra I, this course will extend function concepts to include polynomial, rational, and radical functions. The standards in this course continue the work of modeling situations and solving equations. Proficiencies

I. POLYNOMIALS

- Performing Arithmetic Operations with Complex Numbers
- Solve quadratic equations
- Graph Quadratic Functions in Standard, Vertex, and Intercept Form
- Performing Arithmetic Operations with Polynomials
- Remainder and Factor Theorem
- Factoring Polynomials
- Fundamental Theorem of Algebra
- Interpret Key Features of Polynomial Graphs

II. INVERSE FUNCTIONS AND FUNCTION SYSTEMS

- Perform Function Composition
- Determine the inverse function for a simple function
- Solve systems of linear and quadratic equation in two variables, algebraically and graphically.

III. TRIGONOMETRIC RATIOS AND FUNCTIONS

- Evaluate coterminal and reference angle
- Convert angle measurement between radians and degrees
- Identify degree and radian angle measurements and coordinates of the unit circle
- Evaluate trigonometric functions using the unit circle
- Evaluate inverse of sine, cosine and tangent functions
- Interpret key features and sketch the graphs of the six trigonometric functions
- Use the fundamental trigonometric identities to simplify and rewrite expressions and to verify other identities
- Solve trigonometric identities

IV. RATIONAL AND RADICAL FUNCTIONS

- Perform arithmetic operations with Rational Expressions
- Rewrite simple rational expressions in different forms
- Solve Rational Equations
- Interpret key features of simple and general rational graphs
- Use properties of integer exponents to explain and convert between expressions involving radicals and rational exponents, using correct notation.
- Solve Radical Equations
- Interpret key features of Square Root Function and Cube Root graphs

V. EXPONENTIAL AND LOGARITHMIC FUNCTIONS

- Use properties of exponents to rewrite a function in an equivalent form to reveal and explain different properties of the exponential function.
- Graph exponential functions expressed symbolically or verbally and show key features of the graph.
- Use Functions Involving e
- Rewriting Exponential Equations in Logarithmic Form
- Apply Properties of Logarithms
- Solve Exponential and Logarithmic Equations
- Interpret key features of Logarithmic Functions graphs
- Use properties of exponents to rewrite a function in an equivalent form to reveal and explain different properties of the exponential function.

VI. SEQUENCE AND SERIES

- Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
- Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.

VII. ANALYZE DATA AND STATISTICS

- Identify different methods and purposes for conducting sample surveys, experiments, and observational studies and explain how randomization relates to each. **
- Use data from a randomized experiment to compare two treatments and use simulations to decide if differences between parameters are significant; evaluate reports based on data. **