Glen Ridge Public Schools –Mathematics Curriculum

Course Title: College Algebra

Subject: Mathematics

Grade Level: 12th

Duration: Full Year

Prerequisite: Successful completion of Functions and Relations or Algebra II

Elective or Required: Required

Mathematics Mission Statement

Mathematics is an integral part of our lives. Students must be actively involved in their mathematics education through the use of modeling and demonstrating the ability to persevere through problem solving. The mathematics curricula will emphasize critical thinking skills through a balance of logic and reasoning, attention to precision by utilizing patterns and structure, and bridging these ideas to cross-curricular learning. Students will be engaged and challenged in a student-centered learning environment that is developmentally appropriate and will communicate mathematical ideas, both in a verbal and written form. Through effectively applying hands-on manipulatives, basic computation skills and the use of technical writing to justify their processes, students will critique the work of themselves and others.

Course Description:
This course is intended to provide a foundation of those mathematical skills and concepts that will enable success at the college level. Topics from previous mathematics courses will be reinforced and new material will be introduced to bridge the gap between high school and college mathematics. The curriculum will extend an understanding of the general concepts of relations, polynomial, exponential and logarithmic functions. In addition, students will be introduced to statistics and probability. Numerical operations and algebraic skills will be emphasized in order to prepare students for college placement exams. The incorporation of technology through the use of graphing calculators will be emphasized to facilitate a deeper understanding of higher level mathematics.

Author: Sean Fitzpatrick
Date Submitted: Summer 2017

I Quadratics Review

Approximate # Of Weeks: 7

Essential Questions:

- How can you describe the graph of a quadratic function by looking at its equation in standard form?
- How can you solve a quadratic equation by graphing?
- How can you solve a quadratic equation by graphing on the graphing calculator?
- How can you solve quadratic equations by factoring?
- How can you solve quadratic equations using square roots?
- How can you solve quadratic equations by completing the square?
- How can you solve quadratic equations using the quadratic formula?
- How can you identify which method is most efficient when solving quadratics?
- How can you use vertex form to graph quadratic functions?
- How do you add, subtract, and multiply complex numbers?

Upon completion of this unit students will be able to:

- Graph quadratic functions in standard form.
- Graph quadratic functions in vertex form.
- Find and interpret the maximum and minimum values of a quadratic function
- Solve quadratic functions by graphing by hand and on a graphing calculator.
- Solve quadratic functions by factoring.
- Solve quadratic functions using square roots
- Solve quadratic functions by completing the square.
- Solve quadratic functions using the quadratic formula.
- Use the discriminate to determine how many real solutions a quadratic equation has.
- Perform operations on quadratics with complex numbers.

NJ Student Learning Standards:

- CC.9-12.ASSE.1-3
- CC.9-12.ACED.1-2
- CC.9-12.F.IF.4-9
- CC.9-12F.BF.1
- CC.9-12N.CN.1,2
- CC.9-12.R.EI.4, 11

Interdisciplinary Standards (njcccs.org)

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy
- Standard 8.2 – Technology Education
- Standard 9.1 – 21st - Century Life & Career Skills
- Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- TI-Calculator discovery activities
- Smart notebook lessons

- Online quizzes from textbook website
- Online videos from textbook website
- Graphing Calculator Lab– Modeling Real-World Data
- Graphing Calculator Lab– Solving Quadratic Equations by Graphing
- Graphing Calculator Lab– Solving Quadratic Equations
- Solving Quadratic Equations by Factoring
- Open-Ended discussion questions on Google Classroom
- Class lecture and discussion
- Khan Academy
- Youtube videos

Enrichment Activities:
- Study Guide and Intervention
- Skills Practice
- Word Problem Practice
- Practice
- Mathbits activities

Methods of Assessments/Evaluation:
- Thumbs up/down
- Think-pair-share
- Dry erase response
- Find the mistake
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources
- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	• Recognize quadratic functions in standard form	
2	• Use transformations to graph basic quadratic functions • Be able to solve quadratic by graphing on the graphing calculator	
3	• Be able to solve quadratic functions by graphing by hand and on the calculator • Be able to solve quadratic functions by factoring. • Use the determinant to determine how many solutions a quadratic has.	
4	• Be able to solve quadratic functions using all methods • Be able to go from standard form to vertex form to find the vertex. • Use quadratic functions for real world situations	

II Polynomial Review

Approximate # Of Weeks: 7

Essential Questions:

- What are polynomial functions?
- How do you graph a polynomial function?
- What is the relationship between polynomial division and the Remainder and Factor Theorems?
- How can you find zeros of polynomial functions?
- How can you use synthetic division to determine whether a binomial is a factor of a polynomial?

Upon completion of this unit students will be able to:

- Evaluate polynomial functions
- Make predictions on what the graph will look like based upon the equation.
- Graph polynomials and locate their zeros
- Find the relative maxima and minima of polynomial functions
- Solve polynomials by factoring
- Use synthetic division to evaluate functions
- Determine the number and type of roots for a polynomial equation.

NJ Student Learning Standards:

- CC.9-12. A.APR.2-4
- CC.9-12. A.SSE.2
- CC.9-12. A.CED.1
- CC.9-12. F.IF.2, 4, 7

Interdisciplinary Standards (njcccs.org)

- Standard 5.1 – Science Practices
- Standard 8.1 -- Computer and Information Literacy

● Standard 8.2 – Technology Education
● Standard 9.1 – 21st - Century Life & Career Skills
● Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Open-Ended discussion questions on Google Classroom
- Graphing Calculator Lab: Modeling Data Using Polynomial Functions
- Graphing Calculator Lab: Solving Polynomial Equations by Graphing
- Graphing Calculator Lab: Polynomial Identities (TI-Nspire)
- Graphing Calculator Lab: Analyzing Polynomial Functions
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:
● Study Guide and Intervention
● Skills Practice
● Word Problem Practice
● Practice
● Mathbits activities

Methods of Assessments/Evaluation:
● Thumbs up/down
● Think-pair-share
● Dry erase response
● Find the mistake
● Kahoot
● Homework
● Graded classwork
● Partner activities
● Google Classroom exit ticket/question
● Chapter Test
● Individual problem assessment during lesson
● Graphing calculator check
● Self-Assessment (4-3-2-1)
● Open-ended question
● Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	• Identify polynomials	
2	• Add and Subtract polynomials • Identify the zeros of a polynomial when a graph is given • Graph polynomials	
3	• Multiply polynomials • Divide polynomials using one method • Analyze, describe, and graph polynomials by looking at end behavior • Identify relative maxima and minima of polynomial functions • Find the domain and range of a polynomial function.	
4	• Divide polynomials using long division and synthetic division • Identify relative maxima and minima of polynomial functions to solve real world situations	

III Trigonometric Functions

Approximate # Of Weeks: 7

Essential Questions:

- What are the different parts of the triangle?
- How can we use trigonometry to find the missing angles and sides in a right triangle?
- What does the graph of a trigonometric graph look like?
- How do we use the inverse trigonometric function to find the measure of an angle?
- What is the Law of Sines and the Law of Cosines?
- What is the unit circle?

Upon completion of this unit students will be able to:

- Identify the parts of a right triangle
- Use the six trig functions to find the side lengths of a right triangle
- Find the values of the six trig functions for 30, 45, and 60 degree angles.
- Find the trig value of any acute angle in a right triangle
- Convert angles from degrees to radians and radians to degrees.
- Use the trig functions to find missing parts of a right triangle given any two parts.
- Find arc length
- Define and find reference angles
- Use the inverse trigonometric function to find the measure of an angle
- Use the Law of Sines and the Law of Cosines to find the measure of sides and angles of a right triangle
- Graph the sine and cosine functions

NJ Student Learning Standards:

- CC.9-12.G.SRT.8
- CC.9-12.F.TF.1, 2, 5
- CC.9-12.F.IF.7
- CC.9-12.F.BF.3
- CC.9-12.A.CED.2

Interdisciplinary Standards (njcccs.org)

● Standard 5.1 – Science Practices
● Standard 8.1 -- Computer and Information Literacy
● Standard 8.2 – Technology Education
● Standard 9.1 – 21st - Century Life & Career Skills
● Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Open-Ended discussion questions on Google Classroom
- Graphing Calculator Lab: --Graphs and Transformations of Sine and Cosine
- Enrichment – Truth Tables.
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:

● Study Guide and Intervention
● Skills Practice
● Word Problem Practice
● Practice
● Mathbits activities

Methods of Assessments/Evaluation:

● Thumbs up/down
● Think-pair-share
● Dry erase response
● Find the mistake
● Kahoot
● Homework
● Graded classwork
● Partner activities
● Google Classroom exit ticket/question
● Chapter Test
● Individual problem assessment during lesson
● Graphing calculator check
● Self-Assessment (4-3-2-1)
● Open-ended question
● Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	• Identify the parts of a right triangle	
2	• Convert angles from degrees to radians and radians to degrees. • Define and find reference angles.	
3	• Use the trig functions to find all missing parts of a right triangle given any two parts • Use the inverse trigonometric function to find the measure of an angle	
4	• Use the trigonometric functions to find the solutions to real world applications • Use the Law of Sines and the Law of Cosines to find the measure of sides and angles of a right triangle • Graph the sine and cosine functions	

IV Exponential Functions and Logs (if time permits)

Approximate # Of Weeks: 7

Essential Questions:

- What is an exponential function?
- How does the graph of an exponential growth function change when a, h, and k change?
- What are the characteristics of logarithmic functions?
- How do you solve an exponential equation?
- How do you prove properties of logarithms?
- How do you solve a logarithmic equation?

Upon completion of this unit students will be able to:

- Evaluate and graph exponential growth and decay functions.
- Solve exponential equations
- Evaluate logarithmic expressions
- Graph logarithmic functions
- Simplify and evaluate expressions using the properties of logarithms
- Solve logarithmic equations

NJ Student Learning Standards:

- CC.9-12.ACED.1
- CC.9-12.ASSE.1,2
- CC.9-12. F.BF.3, 5
- CC.9-12.F.IF.2, 7, 8
- CC.9-12.F.LE.3, 4

Interdisciplinary Standards (njcccs.org)

● Standard 5.1 – Science Practices
● Standard 8.1 -- Computer and Information Literacy
● Standard 8.2 – Technology Education
● Standard 9.1 – 21st - Century Life & Career Skills
● Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Graphing Calculator Lab: Solving Exponential Equations and Inequalities
- Graphing Calculator Lab: Choosing the Best Model
- Graphing Calculator Lab: Solving Logarithmic Equations and Inequalities
- Open-Ended discussion questions on Google Classroom
- Desmos/Geogebra online graphing exploration
- Khan Academy
- Youtube videos
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:

● Study Guide and Intervention
● Skills Practice
● Word Problem Practice
● Practice
● Mathbits activities

Methods of Assessments/Evaluation:

● Thumbs up/down
● Think-pair-share
● Dry erase response
● Find the mistake
● Kahoot
● Homework
● Graded classwork
● Partner activities
● Google Classroom exit ticket/question
● Chapter Test
● Individual problem assessment during lesson
● Graphing calculator check

- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator
- Khan Academy
- Desmos

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	• Identify an exponential function	
2	• Evaluate exponential growth and decay functions.	
3	• Graph exponential growth and decay functions. • Solve logarithmic equations	
4	• Simplify and evaluate expressions using the properties of logarithms • Make predictions using logarithmic and exponential functions. • Solve real world applications using logarithmic equations	

V Prob/Statistics

Approximate # Of Weeks: 6

Essential Questions:

- What are the different ways we collect data?
- How can we determine if there is a bias in statistics?
- What is the standard deviation of a sample?
- How do you calculate standard devation?
- How does the shape of a distribution affect the selection of measures of center and variation?
- How does construct and analyze a probability distribution?
- What is a z-score?
- How do you calculate a z-score?

Upon completion of this unit students will be able to:

- Identify and be able to use different sampling techniques
- Classify different statistical study types
- Identify bias in survey questions
- Identify and make suggestions on how to fix flaws in the design of an experiment

- Understand and calculate measures of central tendency and variation by hand and by using a calculator
- Use the shapes of distributions to select appropriate statistics
- Use a calculator to construct either a histogram or a box-and-whisker plot and find the appropriate summary statistics for a given data set
- Use appropriate statistics to compare two sets of data
- Construct a probability distribution
- Calculate standard deviation and expected value
- Use expected values and standard deviations to make appropriate decisions about random variables
- Demonstrate an understanding of how to find and use the z-score for a data value in a set of normally distributed data
- Use z-scores to locate a data value's position in a normally distributed set of data
- Use the appropriate formula to estimate the maximum error of an estimate
- Construct a confidence interval for a population mean using the maximum error formula and a calculator

NJ Student Learning Standards:

- CC.9-12.A.APR.7
- CC.9-12.ASSE.1
- CC.9-12. A.REI.2
- CC.9-12.A.CED.1-3

Interdisciplinary Standards (njcccs.org)

● Standard 5.1 – Science Practices
● Standard 8.1 -- Computer and Information Literacy
● Standard 8.2 – Technology Education
● Standard 9.1 – 21st - Century Life & Career Skills
● Standard 9.3 – Career Awareness, Exploration, and Preparation

Activities – include 21st Century Technologies:

- SmartBoard powerpoint presentations
- Lecture and class discussion
- Open-Ended discussion questions on Google Classroom
- Graphing Calculator Lab: Simulations and Margin of Error
- Chapter Project: Please Complete This Survey
- Enrichment – Truth Tables.
- Online quizzes from textbook website
- Online videos from textbook website

Enrichment Activities:

● Study Guide and Intervention
● Skills Practice
● Word Problem Practice
● Practice
● Mathbits activities

Methods of Assessments/Evaluation:

- Thumbs up/down
- Think-pair-share
- Dry erase response
- Find the mistake
- Kahoot
- Homework
- Graded classwork
- Partner activities
- Google Classroom exit ticket/question
- Chapter Test
- Individual problem assessment during lesson
- Graphing calculator check
- Self-Assessment (4-3-2-1)
- Open-ended question
- Skyward quizzes

Resources/Including Online Resources

- Online Textbook Information: connected.mcgraw-hill.com
- Google Classroom
- Various Youtube channels
- TI-83/84 Graphing Calculator

Prerequisite Learning Goals Self-Assessment Chart

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	• Identify a survey that is biased • Use a calculator to construct either a histogram or a box-and-whisker plot	
2	• Calculate measures of central tendency and variation by hand • Calculate the z-score for a data value in a set	
3	• Understand and calculate measures of central tendency and variation by hand and by using a calculator • Use z-scores to locate a data value's position in a normally distributed set of data	
4	• Use appropriate statistics to compare two sets of data • Use statistics to model a real life situation.	