SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: College Algebra (College in the High School/Math 103)	**Length of Course:** 15 cycles
Grade Level(s): 11-12	**Periods Per Cycle:** 6
Units of Credit: 1 for High School; 3 for College	**Length of Period:** 43 minutes
Classification: Elective	**Total Instructional Time:** 64.5 hours

Course Description

This course offers a similar approach as Algebra 1, but will require a more in-depth analysis of the concepts and will integrate Algebra 2 concepts into the structure. The course is designed to help students master the fundamental algebraic operations, explore and solve exponential and radical expressions and equations, analyze and solve systems of equations in two or more variables. Additionally, students will have an in-depth study of functions, both quadratic and higher order polynomials, as well as combinations of each. The course will conclude with a unit focused on solving higher degree equations, logarithms, and inequalities.

Instructional Strategies, Learning Practices, Activities, and Experiences

Posted Objectives and Agendas Bell Ringers Critical Thinking Class Discussions	Group Activities Group Projects Note Taking Teacher Demonstration Technology Integration	Guided Practice Individual Practice Problems Sets Flexible Grouping Graphic Organizers

Assessments

Projects	Graded Assignments Quizzes	Final Exam Classwork

Materials/Resources

Text: College Algebra, J. Abramson 2021; OpenStax		

Adopted: 5/24/21
Revised:

CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
Unit 1: Equations and Inequalities • Graphs and Graphing Utilities • Linear and Rational Equations • Models and Applications • Complex Numbers • Quadratic Equations • Other Types of Equations • Linear and Absolute Value Inequalities	**Objectives:** 1. Students will be able to plot points and graph equations in the rectangular coordinate system. 2. Students will be able to interpret information given by graphs. 3. Students will be able to solve linear equations. 4. Students will be able to solve applied problems using mathematical models. 5. Students will be able to solve a formula for a variable. 6. Students will be able to perform operations on complex numbers. 7. Students will be able to solve quadratic equations. 8. Students will be able to solve polynomial and radial equations. 9. Students will be able to solve inequalities. **Standards:** **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context. **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model. **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials. **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms. **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable. **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method. **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. **CC.2.1.HS.F.7** Apply concepts of complex numbers to polynomial identities and quadratic equations to solve problems.

CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
Unit 2: Functions and Graphs • Basics of Functions and Their Graphs • Linear Functions and Slopes • Transformation of Functions • Combinations of Functions • Inverse Functions • Distance, Midpoint, Circles	**Objectives:** 1. Students will be able to identify functions. 2. Students will be able to evaluate a function. 3. Students will be able to graph a function by plotting points. 4. Students will be able to identify and use piecewise functions. 5. Students will be able to recognize and use the general form and the slope intercept form of an equation to graph a function. 6. Students will be able to model data with linear functions and make predictions. 7. Students will be able to find slopes and equations of parallel and perpendicular lines. 8. Students will be able to graph functions using a sequence of transformations. 9. Students will be able to form composite functions. 10. Students will be able to find the inverse of a function. 11. Students will be able to find the distance between two points. 12. Students will be able to find the midpoint of a line segment. 13. Students will be able to write the standard form of a circle's equation. **Standards:** **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context. **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations. **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities. **CC.2.2.HS.C.4** Interpret the effects transformations have on functions and find the inverses of functions. **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model. **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships. **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method. **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
Unit 3: Polynomial and Rational Functions • Quadratic Functions • Polynomial Functions and Their Graphs • Dividing Polynomials, Remainder, and Factor Theorem • Zeros of Polynomials • Rational Functions and Their Graphs • Polynomial and Rational Inequalities • Modeling Using Variations	**Objectives:** 1. Students will be able to recognize characteristics of parabolas. 2. Students will be able to graph parabolas. 3. Students will be able to determine a quadratic function's minimum or maximum value. 4. Students will be able to identify polynomial functions. 5. Students will be able to recognize characteristics of graphs of polynomial functions and identify end behavior. 6. Students will be able to identify zeros and their multiplicities. 7. Students will be able to use the Intermediate Value Theorem. 8. Students will be able to graph polynomial functions. 9. Students will be able to use long division and synthetic division to divide polynomials. 10. Students will be able to evaluate a polynomial using the Remainder Theorem. 11. Students will be able to use the Factor Theorem to solve a polynomial equation. 12. Students will be able to use the Rational Zero Theorem to find possible rational zeros. 13. Students will be able to find the zeros of a polynomial function. 14. Students will be able to solve polynomial equations. 15. Students will be able to find the domains of rational functions. 16. Students will be able to identify vertical asymptotes and horizontal asymptotes. 17. Students will be able to graph rational functions. 18. Students will be able to solve polynomial inequalities. 19. Students will be able to solve rational inequalities. 20. Students will be able to solve direct and inverse variation problems. 21. Students will be able to solve combined variation problems. **Standards:** **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context. **CC.2.2.HS.C.5** Construct and compare linear, quadratic, and exponential models to solve problems. **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model. **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials. **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms. **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method. **CC.2.2.HS.C.5** Construct and compare linear, quadratic, and exponential models to solve problems.

Unit 4: Exponential and Logarithmic Functions

- Exponential Functions
- Logarithmic Functions
- Properties of Logarithms
- Exponential and Logarithmic Equations
- Exponential Growth and Decay Modeling

Objectives:

1. Students will be able to evaluate exponential functions.
2. Students will be able to graph exponential functions.
3. Students will be able to evaluate functions with base.
4. Students will be able to use compound interest formulas.
5. Students will be able to change from logarithmic to exponential form and vice versa.
6. Students will be able to evaluate logarithms.
7. Students will be able to use basic logarithmic properties.
8. Students will be able to graph logarithmic functions.
9. Students will be able to use common and natural logarithms.
10. Students will be able to use the product, quotient, and power rule to expand logarithms.
11. Students will be able to condense logarithmic expressions.
12. Students will be able to use the change-of-base formula.
13. Students will be able to solve exponential equations.
14. Students will be able to solve logarithmic equations.
15. Students will be able to solve applied problems involving exponential and logarithmic equations.
16. Students will be able to use logistic growth models.
17. Students will be able to model exponential growth and decay.

Standards:

CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.

CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
Unit 5: Systems of Equations • Systems of Linear Equations in Two Variables • Systems of Linear Equations in Three Variables	**Objectives:** 1. Students will be able to determine whether an ordered pair is a solution of a linear system. 2. Students will be able to solve linear systems by substitution. 3. Students will be able to solve linear systems by addition. 4. Students will be able to solve problems using systems of linear equations. **Standards:** **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities. **CC.2.2.HS.C.5** Construct and compare linear, quadratic, and exponential models to solve problems. **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method. **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.