The mission of Hermon High School is to prepare students for personal success in college, career, and community.

Algebra 2

Instructor(s):
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Course Description:
This college preparatory course will include an examination of linear relations and functions, quadratic, polynomial and radical functions, advanced functions and relations, and linear programming. Students who successfully complete this course will be prepared for College Technical Math I, Precalculus, Statistics, or a college level Algebra or Precalculus course. Students planning to enroll in AP Precalculus should enroll in Honors Algebra II.

Course Length/Credit
2 semesters/1 credit

Unit 1	**Linear Functions and Systems of Equations**
Summary	This unit will review the essential skills of Algebra 1 that are needed in Algebra 2. Topics include: functions, writing and graphing linear equations, and systems of equations.

Graduation Standards: (the number of the standard is referenced in the performance indicators listed in each unit.)

HS.M.1A Applies properties of real numbers and quantitative reasoning.
HS.M.2A Solves polynomial, rational, radical, and transcendental equations & systems of equations.

Performance Indicators Assessed in Unit	• AR.A.2 - Write expressions in equivalent forms to reveal information and to solve problems. • AR.A.7 - Create equations and/or inequalities that describe numbers and relationships. • AR.A.10 - Solve systems of equations. • AR.A.11 - Represent and solve equations and inequalities graphically. • AR.A.14 - Analyze functions using different representations. Supporting Performance Indicators • AR.A.15 - Build a function that models a relationship between two quantities. • QR.A.3 - Reason quantitatively and use units to solve problems.

Understandings:	Students will know…	Students will be able to…
● The different forms of linear equations and how they are applied to solving problems. ● The different methods of solving systems of equations and which ones are most appropriate when solving problems.	● How to evaluate functions. ● How to represent functions using multiple representations. ● How to convert linear equations from standard form to slope-intercept form, and vice versa. ● How to calculate *x* and *y*-intercepts and use those points to graph the equations. ● How to identify equations that are parallel and perpendicular. ● How to solve systems of equations by graphing, substitution, and elimination. ● How to apply systems of equations to real life situations.	● Make sense of problems and persevere in solving them. ● Model with mathematics. ● Use appropriate tools strategically.

Unit 2	**Radical Expressions & Equations**
Summary	In this unit, students will simplify radical expressions. They will create prime factorizations of numbers and simple square roots, as well as nth roots. Radical expression will be used in arithmetic operations. Students will represent radical expressions as expressions with rational exponents and rationalize denominators. Properties of exponents will be revisited, as students work with rational exponents. Negative exponents will be discussed. Students will also solve equations involving radicals.

Graduation Standards: (the number of the standard is referenced in the performance indicators listed in each unit.)

HS.M.1A Applies properties of real numbers and quantitative reasoning.
HS.M.2.A Solves polynomial, rational, radical, and transcendental equations & systems of equations.

Performance Indicators Assessed	● QR.A.1- Extend the properties of exponents to rational exponents. ● QR.A.2 - Use properties of rational and irrational numbers ● QR.A.4 - Perform arithmetic operations with complex numbers.

in Unit	● AR.A.8 - Understand solving equations as a process of reasoning and explain the reasoning. Supporting Performance Indicators ● AR.A.2 - Write expressions in equivalent forms to reveal information and to solve problems.

Understandings:	**Students will know…**	**Students will be able to…**
● The different forms of linear equations and how they are applied to solving problems. ● The different methods of solving systems of equations and which ones are most appropriate when solving problems.	● How to simplify expressions using the properties of exponents. ● How to simplify radicals. ● How to perform operations with radicals. ● How to simplify negative radicals using *i*. ● How to write expressions with rational exponents in radical form and vice versa. ● Solve equations containing radicals.	● Make sense of problems and persevere in solving them. ● Model with mathematics. ● Use appropriate tools strategically.

Unit 3	**Functions**
Summary	In this unit, students will review the basic concepts of functions, including notation, representation, and evaluating. They will identify domain and range, as well as other characteristics of the function graph. The unit will end with application of piecewise functions.

Graduation Standards: (the number of the standard is referenced in the performance indicators listed in each unit.)

HS.M.2B Understands and analyzes polynomial, rational, radical, and transcendental functions.

Performance Indicators	● AR.A.12 Understand the concept of a function and use function notation. ● AR.A.13 Interpret functions that arise in applications in terms of the context. ★

Assessed in Unit	● AR.A.14 Analyze functions using different representations. ● AR.A.15 Build a function that models a relationship between two quantities. ★ ● AR.A.16 Build new functions from existing functions.

Understandings:	**Students will know…**	**Students will be able to…**
● Real world data can be modeled with a function. ● Functions can be written in various forms, including graphs, tables and equations. ● Graphs can be translated to describe a variety of situations.	● How to evaluate a function. ● Identify the domain and range of a function. ● Evaluate a function given a value. ● Graph and interpret piecewise functions. ● Connect real world application problems to functions.	● Reason abstractly and quantitatively. ● Model with mathematics. ● Use appropriate tools strategically. ● Attend to precision.

Unit 4	**Quadratics**
Summary	This unit is an overview of quadratic equations and functions. Students will solve quadratic equations by graphing, factoring, and using the Quadratic Formula. Students will explore how values of a quadratic equation are reflected in a parabola that represents it; they will use equations and graphs to explore quadratic equations that have 0,1, or 2 roots. Students will also relate the value of the discriminant to the number of roots and to whether the roots are rational, irrational or complex.

Graduation Standards: (the number of the standard is referenced in the performance indicators listed in each unit.)

HS.M.2A Solves polynomial, rational, radical, and transcendental equations & systems of equations
HS.M.2B Understands and analyzes polynomial, rational, radical, and transcendental functions.

Performance Indicators Assessed in Unit	QR.A.4 (+) -Perform arithmetic operations with complex numbers. AR.A.15 - Build a function that models a relationship between two quantities. ★ AR.A.16 - Build new functions from existing functions.

	AR.A.17 - Construct and compare linear, quadratic, and exponential models and solve problems. ★

Understandings:	**Students will know…**	**Students will be able to…**
● Solutions to quadratic equations can be found using various methods. ● Some solutions to quadratic equations may be complex. ● The relationship between zeros and solutions.	● How to factor quadratic equations. ● How to identify special products when factoring. ● How to graph quadratic functions and identify the solutions from the graph. ● Use the quadratic formula to solve quadratic equations. ● Compute solutions to quadratic equations involving complex numbers. ● *How to solve quadratic equations by completing the square and by using the square root property. (Honors)*	● Reason abstractly and quantitatively. ● Model with mathematics. ● Use appropriate tools strategically. ● Attend to precision.

Unit 5	**Polynomial & Polynomial Expressions**
Summary	In this unit students will add, subtract, multiply, divide, and factor polynomials. They will analyze and evaluate polynomial functions. Students will identify the end behavior and zeros of polynomial functions and sketch their graphs.

Graduation Standards: (the number of the standard is referenced in the performance indicators listed in each unit.)

HS.M.2A Solves polynomial, rational, radical, and transcendental equations & systems of equations.
HS.M.2B Understands and analyzes polynomial, rational, radical, and transcendental functions.

Performance Indicators Assessed in Unit	AR.A.3 - Perform arithmetic operations on polynomials. AR.A.4 - Understand the relationship between zeros and factors of polynomials. AR.A.5 (+) - Use polynomial identities to solve problems.

Understandings:	Students will know…	Students will be able to…
● How key features of a polynomial function can be used to create graphs. ● How the degree of a polynomial affects the shape of the graph and its end behavior. ● How techniques of factoring a quadratic function can be extended to higher degree models.	● How to perform operations with and simplify with polynomial functions. ● How to determine if a binomial is a factor of a polynomial using the Remainder Theorem. ● How to factor polynomials with a degree higher than quadratic. ● How to solve polynomial equations by factoring. ● How to determine the end behavior of polynomial functions. ● How to sketch polynomial functions using the zeros and end behavior.	● Reason abstractly and quantitatively. ● Model with mathematics. ● Use appropriate tools strategically. ● Attend to precision. ● Look for and express regularity in repeated reasoning.

Unit 6	**Rational Expressions and Equations (may be completed if time allows)**
Summary	In this unit students will discover that rational expressions can be represented in different ways. In simplest form, a rational expression has a numerator and denominator with no common factors except one. Addition, subtraction, multiplication and division will be used to simplify rational expressions. The unit will conclude with students solving equations involving rational expressions, and developing an understanding of an extraneous solution.

Graduation Standards: (the number of the standard is referenced in the performance indicators listed in each unit.)

HS.M.2B Understands and analyzes polynomial, rational, radical, and transcendental functions.

Performance Indicators Assessed in Unit	● AR.A.2 Write expressions in equivalent forms to reveal information and to solve problems. ● AR.A.6 Rewrite rational expressions ● AR.A.9 Solve equations and inequalities in one variable

Understandings:	Students will know…	Students will be able to…
Students will understand that…	● how to simplify a rational expression.	● Reason abstractly and quantitatively.

● rational expressions have excluded values. ● rational expressions can be simplified using the process of factoring. ● rational expressions can be added, subtracted, multiplied and divided using the same methods of adding and subtracting rational numbers.	● how to perform operations with rational expressions including adding, subtracting, multiplying and dividing. ● how to determine the excluded values of a rational expression. ● how to solve equations involving rational expressions.	● Model with mathematics.. ● Attend to precision.

Unit 7	**Probability and Statistics**
Summary	In this unit students will investigate probability. Students will calculate permutations and combinations, and probabilities involving both. Students will work with a hands on demonstration of probability and the use of expected values.

Graduation Standards: (the number of the standard is referenced in the performance indicators listed in each unit.)

HS.M.5.D Computes probability and uses known probability distributions to solve problems.

Performance Indicators Assessed in Unit	● SR.A.6 Understand independence and conditional probability and use them to interpret data. ● SR.A.7 Use the rules of probability to compute probabilities of compound events in a uniform probability model. ● SR.A.8 Calculate expected values and use them to solve problems. ● SR.A.9 Use probability to evaluate outcomes of decisions.

Understandings:	**Students will know…**	**Students will be able to…**
● Probability quantifies the likelihood that something will happen and enables us to make predictions and informed decisions. ● Discussing and determining the likelihood of an event relies on recognizing when to utilize the fundamental counting principle and recognizing which type of probability is being used.	● how to use two-way frequency tables to find marginal, joint, and conditional relative frequencies. ● how to solve problems involving independent and dependent events. ● how to find probabilities (theoretical and conditional). ● how to calculate expected values.	● Reason abstractly and quantitatively. ● Model with mathematics. ● Use appropriate tools strategically.

Summative Assessments/Retake

- Summative assessments will count as 70% of the grade.
- Students have the opportunity to retake summative assessments.
- The student must submit a retake form to the teacher within five (5) school days of the date that the summative assessment score is reported to the student.
- The highest score a student can receive on a retake or late assessment is a 75.
- The score achieved on a retake will replace the current score (even if the score is lower).
- If a student is making up a test from an absence, that assessment will be graded up to 100.

Make-up Work

Upon their return to school from an absence, it is the student's responsibility to secure make-up work from their teacher. The due date of the missed work will be one additional class period for each day of absence from that class or at the discretion of the teacher.

Grading of Formative Assessments

- Formative assessments will count as 30% of the grade.
- Formative assessments may be scored on either a 0 -100 scale or a 0 - 4 scale.
- The 0 - 4 scale will be represented in Power School as 4 =100, 3 = 87, 2 = 77, and 1 = 67.
- The method of scoring of formative assessments will be determined by assignment.

Finals / Midterms

An end of course Final Exam will be conducted, making up 10% of the students overall grade.