Algebra II Syllabus 2019 – 2020

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Text: *Henry County School GSE Advanced Algebra Flexbook* .
Georgia Standards; Frameworks located at www.georgiastandards.org

Algebra II is a rigorous integrated mathematics course covering the topics listed in the content map below. This class is designed for the math student who is seeking a background that will prepare the student for advanced math and science courses. Students should be self-motivated and exhibit excellent study skills to properly succeed.

Standards	**Fall Semester**		
Unit 1	**Unit 2**	**Unit 3**	**Unit 4 (Split between both semesters)**
Quadratics Revisited	**Operations With Polynomials**	**Polynomial Functions**	**Rational & Radical Relationships**
Perform arithmetic operations with complex numbers. **MGSE9-12.N.CN.1** – Understand there is a complex number *i* such that $i^2 = -1$, and every complex number has the form a + b*i* where a and b are real numbers. **MGSE9-12.N.CN.2** – Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. *Use complex numbers in polynomial identities and equations.* **MGSE9-12.N.CN.7** – Solve quadratic equations with real coefficients that have complex solutions by (but not limited to) square roots, completing the square, and the quadratic formula. **MGSE9-12.N.CN.8** – Extend polynomial identities to include factoring with complex numbers. For example, rewrite $x^2 + 4$ as $(x + 2i)(x – 2i)$. *Solve equations and inequalities in one variable.* **MGSE9-12.A.REI.4** – Solve quadratic equations in one variable. **MGSE9-12.A.REI.4b** – Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation. *Extend the properties of exponents to rational exponents.* **MGSE9-12.N.RN.1** – Explain how the meaning of rational exponents follows from extending the properties of integer exponents to rational numbers, 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 $(5^{(1/3)})^3 = 5^{((1/3)x3)}$ to hold, so $(5^{(1/3)})^3$ must equal 5. **MGSE9-12.N.RN.2** – Rewrite expressions involving radicals and rational exponents using the properties of exponents.	*Perform arithmetic operations on polynomials* **MGSE9-12.A.APR.1**– Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations. **MGSE9-12.A.APR.5**– Know and apply that the Binomial Theorem gives the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. *Rewrite rational expressions* **MGSE9-12.A.APR.6**– Rewrite simple rational expressions in different forms using inspection, long division, or a computer algebra system; 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). *Build a function that models a relationship between two quantities* **MGSE9-12.F.BF.1**– Write a function that describes a relationship between two quantities. **MGSE9-12.F.BF.1b**– Combine standard function types using arithmetic operations in contextual situations (Adding, subtracting, and multiplying functions of different types). **MGSE9-12.F.BF.1c**– Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. *Build new functions from existing functions* **MGSE9-12.F.BF.4**– Find inverse functions **MGSE9-12.F.BF.4a**– Solve an equation of the form f(x) = c for a simple function f that has an inverse and write as expression for the inverse. For example, $f(x) = 2(x^3)$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$. **MGSE9-12.F.BF.4b**– Verify by composition that one function is the inverse of another. **MGSE9-12.F.BF.4c**– Read values of an inverse function from a graph or a table, given that the function has an inverse.	**MGSE9-12.N.CN.9**– Use the Fundamental Theorem of Algebra to find all roots of a polynomial equation. *Interpret the structure of expressions* **MGSE9-12.A.SSE.1**– Interpret expressions that represent a quantity in terms of its context. **MGSE9-12.A.SSE.1a**– Interpret parts of an expression, such as terms, factors, and coefficients, in context. **MGSE9-12.A.SSE.1b**– Given situations which utilize formulas or expressions with multiple terms and/or factors, interpret the meaning (in context) of individual terms or factors. **MGSE9-12.A.SSE.2**– Use the structure of an expression to rewrite it in different equivalent forms. 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 $(x^2-y^2)(x^2+y^2)$ *Understand the relationship between zeros and factors of polynomials* **MGSE9-12.A.APR.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). **MGSE9-12.A.APR.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. *Use polynomial identities to solve problems* **MGSE9-12.A.APR.4**– Prove polynomial identities and use them to describe numerical relationahips. For example, the polynomial identity $(x^2+y^2)^2 = (x^2-y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples. *Interpret functions that arise in applications in terms of the context* **MGSE9-12.F.IF.4**– Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior. *Analyze functions using different representations* **MGSE9-12.F.IF.7**– Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. **MGSE9-12.F.IF.7c**– Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	*Rewrite rational expressions* **MGSE9-12.A.APR.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. *Create equations that describe numbers or relationships* **MGSE9-12.A.CED.1**– Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions. **MGSE9-12.A.CED.2**– Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1+r/n)^{nt}$ has multiple variables.) *Understand solving equations as a process of reasoning and explain the reasoning* **MGSE9-12.A.REI.2**– Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **MGSE9-12.F.IF.4**– Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. *Interpret functions that arise in applications in terms of the context* **MGSE9-12.F.IF.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 an appropriate domain for the function. *Analyze functions using different representations* **MGSE9-12.F.IF.7**– Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. **MGSE9-12.F.IF.7b**– Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. **MGSE9-12.F.IF.7d**– Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

Standards	Spring Semester	
Unit 5	**Unit 6**	**Unit 7**
Exponentials & Logarithms	**Mathematical Modeling**	**Inferences & Conclusions from Data**
Write expressions in equivalent forms to solve problems **MGSE9-12.A.SSE.3**– Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **MGSE9-12.A.SSE.3c**– Use the properties of exponents to transform expressions for exponentials functions. For example, the expression 1.15^t, where t is in years, can be rewritten as $(1.15^{(1/12)})^{12t} \approx 1.012^{(12t)}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. *Analyze functions using different representations* **MGSE9-12.F.IF.7**– Graph functions expressed algebraically and show key features of the graph both by hand and by using technology. **MGSE9-12.F.IF.7e**– Graph exponential and logarithmic functions, showing intercepts and end behavior. **MGSE9-12.F.IF.8**– Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **MGSE9-12.F.IF.8b**– Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{(12t)}$, $y = (1.2)^{(t/10)}$, and classify them as representing exponential growth and decay. *Build new functions from existing functions* **MGSE9-12.F.BF.5**– Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. *Construct and compare linear, quadratic, and exponential models and solve problems* **MGSE9-12.F.LE.4**– For exponential models, express as a logarithm the solution to $ab^{(ct)} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	*Write expressions in equivalent forms to solve problems* **MGSE9-12.A.SSE.4**– 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. **MGSE9-12.A.CED.1**– Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions. **MGSE9-12.A.CED.2**– Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1+r/n)^{nt}$ has multiple variables.) **MGSE9-12.A.CED.3**– Represent constraints by equations or inequalities, and by systems of equation and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. non-solution) under the established constraints. **MGSE9-12.A.CED.4**– Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations. Examples: Rearrange Ohm's law V = IR to highlight resistance R; Rearrange area of a circle formula $A = \pi r^2$ to highlight the radius r. *Represent and solve equations and inequalities graphically* **MGSE9-12.A.REI.11**– Using graphs, tables, or successive approximations, show that the solution to the equation f(x) = g(x) is the x-value where the y-values of f(x) and g(x) are the same. *Interpret functions that arise in applications in terms of the context* **MGSE9-12.F.IF.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. **MGSE9-12.F.IF.9**– Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one function and an algebraic expression for another, say which has the larger maximum. *Building new functions from existing functions* **MGSE9-12.F.BF.3**– Identify the effect on the graph of replacing f(x) by f(x)+k, kf(x), f(kx), and f(x+k) for specific values of k (both positive and negative); find the values of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and off functions from their graphs and algebraic expressions for them.	*Summarize, represent, and interpret data on a single count or measurement variable* **MGSE9-12.S.ID.2**– Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. **MGSE9-12.S.ID.4**– Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. *Understand and evaluate random processes underlying statistical experiments* **MGSE9-12.S.IC.1**– Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **MGSE9-12.S.IC.2**– Decide if a specific model is consistent with the results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model? *Make inferences and justify conclusions from sample surveys, experiments, and observational studies* **MGSE9-12.S.IC.3**– Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. **MGSE9-12.S.IC.4**–Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. **MGSE9-12.S.IC.5**– Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. **MGSE9-12.S.IC.6**– Evaluate reports based on data. For example, determining quantitative or categorical data; collection methods; biases or flaws in data.

Expectations:

- Students are to be in class, prepared, and ready to learn when the bell rings to begin the period. Class will be dismissed at the teacher's instruction.
- Students will actively participate in class in a manner that facilitates learning the material being presented or reviewed.
- Students who are absent from class, and the absence is excused according to the student handbook, are responsible to determine what work was missed and make up that work according to the timeline set forth in the student handbook.
- Students will handle technology responsibly. Technology use can be very helpful in the classroom but that which is not conducive to learning the material will not be allowed.

Grading:

- Grades are cumulative for the entire year.
- Formative and Summative work and grades, together, count 80% of the overall grade. 40 % for Practice work and 40% for Assessments.
- The Final Exam counts 20% of the final grade.

Materials:

- Students are required to have pencils and paper though they will also find items such as rulers and graph paper useful.
- A three-ring binder or another method students find useful will be needed for organizing notes and monitoring standards throughout the course.
- Students will need a Graphing Calculator (examples include: TI-83/83+, TI-84/84+, TI-*n*spire, TI-*n*spire CX, Casio PRIZM FX-CG10, Classpad 300, FX-9750GPlus, 9860G). A classroom set of TI calculators will be available for use during class.

Communication:

- If you wish to contact me, please e-mail me at any time. I will answer e-mails within 24-hours unless I'm out of town.
- If you desire a parent conference, you will need to schedule it through the school counseling office.
- Grades are accessible through Infinite Campus. It is recommended that you monitor Infinite Campus on a regular basis. I update Infinite Campus according to the schedule set forth by Henry County Schools (and, when possible, more often).
- I attend many of the school's sporting, academic, and cultural events, so on many Fridays and Saturdays you can speak with me at one of these activities.

What can students do to be successful?

- ***Be in class every day.***
- ***Pay attention throughout the entire class time.*** We have reached a time where a new concept is being presented or discovered each day. If a student is distracted during class they will miss things that are important to gain understanding.
- This is an honours-level class and will move quicker than the regular course and at a deeper level of understanding. There will be material presented in this course that goes beyond the regular state curriculum, as should be expected for such a course.
- If a student has a question or they do not believe they understand something, come in and get help before or after school, as tutoring is available, as soon as possible. The longer a student waits to get questions answered the more difficult it becomes to catch up.

Technology

- The purpose of the new electronic device policy is to make sure that there is no distraction to the learning environment and that every student can be completely focused on academic achievement.
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- If a student is in possession of any electronic devices (smartphone, tablet, etc.), then those devices must be placed in an assigned pocket of a classroom phone caddy during every class period including instructional focus. If you have more than one device, (ex: multiple smartphones, and/or tablets), then both items must be placed in the assigned pocket. Students will be allowed to use their devices in the morning in the commons area before first period, between class changes, and during lunches (as long as they are not speaking on the phone or playing music that others can hear).
- Please note that failure to comply with this expectation will result in a discipline referral and appropriate consequences will be given. Also, ELHS is not responsible for lost or stolen electronic devices. Students are encouraged to leave "non-instructional" personal items at home. The school-issued Chromebooks are the only electronic devices that are needed in the instructional setting.