Advanced Algebra

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Advanced Algebra:	This course is a third year math class. Students should have passed Algebra and Geometry. We will cover units on solving equations and inequalities, functions and their inverses, logarithms and exponentials, parent graphs and their transformations, rational expressions and their operations, polynomials and their graphs, complex numbers, trigonometric functions, and statistics. The students will be tested on each unit and a cumulative final at the end of each semester.
Text:	We have no text for this class. We will be doing worksheets for each class. This means that missing a class will require a student to contact me for help on missing work. I will email the work or they can access the work on my website. The student will possibly need to come for help with the notes.
Grading:	90% Summative Assessment. 10% Formative Assignment.
Classwork:	The students will do a worksheet introducing the section covered that day.
Homework:	The students will be assigned a worksheet reinforcing the section notes done in class. In the cases of review assignments, there will be specifically a class assignment worksheet and a homework assignment worksheet. Most students should be able to finish the assignments before the end of the class.
Review Worksheets:	The students will usually get at least two review days before each test. On these days, we will do a review worksheet for classwork and another review worksheet as homework.
Tests:	Semester 1: Unit 1, Unit 2, Unit 3, Unit 4 and Semester 1 Final. Semester 2: Unit 5, Unit 6, Unit 7, Unit 8, Unit 9 and Semester 2 Final. Each test can be retaken once. This could change due to timing from various outside influences, such as weather.
Late work:	Late work will be accepted until the end of the grading period, semester. I do not encourage students to fall that far behind, but I will always reward the effort to catch up.
Work Samples:	We will do one or two work samples in the class, depending on time allowed. The work samples can count towards essential skills credit.
Goal:	It is my goal to make sure that every student has all of the math credits and work samples they need to graduate by the end of this class. I also hope to encourage and embolden the students to further their math career.

Please feel free to contact me at any time with any concerns. Thank you.
Due to many possible reasons synopsis is subject to change.

Resources:
My website is on the Franklin staff page. You simply go to the date you missed and you will find blank copies of the worksheets for that day as well as keys for the notes and assignments. Franklin also offers a tutoring center, which I recommend. We have tutorials during full 5-day weeks, but it is rare that I am available for intensive one-on-one tutoring. To make up for my lack of outside-of-school time, there are a bank of videos on YouTube on my wife's Andrews Algebra channel; they can be found under the Advanced Algebra 2018-2019 playlist (for now- eventually they will be updated for this year)

Differentiation Strategies:
Students will be given tiered questions on a daily basis; we will be able to determine the level of difficulty they reach by how far they get in the assignment. Students will be able to learn the basics as well as to push themselves by finishing all of the assignment. Honors credit is available for students interested. Vocabulary will be available to all students for each unit. Vocabulary will be covered in the notes worksheets for each lesson as well as the most common mistakes made for each topic.

Standards Covered
Please be aware that the standards below are very wide, and can be interpreted in many ways.

Unit 1: Equations and Inequalities
Priority Standards:
HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
Supporting Standards:
HSA.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
HSA.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

Unit 2: Parent Graphs
Priority Standards:
HSF.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.*
HSF.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.*
HSF.IF.C.7.B Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
HSF.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.
HSF.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 an appropriate domain for the

function.*
Supporting Standards:
HSF.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
HSA.SSE.B.3.A Factor a quadratic expression to reveal the zeros of the function it defines.
HSA.SSE.B.3.B Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
HSG.GPE.A.2 Derive the equation of a parabola given a focus and directrix.
HSF.BF.A.1 Write a function that describes a relationship between two quantities.*

Unit 3: Inverses
Priority Standards:
HSF.BF.B.4 Find inverse functions.
HSF.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) =2 x3 or f(x) = (x+1)/(x-1) for x ≠ 1.

Unit 4: Logarithms and Exponentials
Priority Standards:
HSF.LE.A.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and dare numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
HSF.IF.C.7.E Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
Supporting Standards:
HSF.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.*
HSF.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.
HSF.BF.A.1.A Determine an explicit expression, a recursive process, or steps for calculation from a context.
HSF.BF.A.1.B Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.
HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.

Unit 5: Complex Numbers and Roots
Priority Standards:
HSN.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.
HSN.CN.A.2 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
HSN.CN.C.7 Solve quadratic equations with real coefficients that have complex solutions.

Unit 6: Polynomials
Priority Standards:
HSA.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.
HSA.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.
HSF.IF.C.7.C Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
Supporting Standards:
HSA.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).
HSA.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.
HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.*
HSA.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients.
HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.
HSF.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.*
HSF.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

Unit 7: Rational Expressions
Priority Standards:
HSA.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.
Supporting Standards:
HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it. 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 $(x^2 - y^2)(x^2 + y^2)$.
HSA.SSE.B.3.A Factor a quadratic expression to reveal the zeros of the function it defines.
HSN.RN.B.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational

Unit 8: Trigonometric Functions
Priority Standards:
HSF.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.
HSF.TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*
HSF.IF.C.7.E Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
Supporting Standards:
HSF.TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
HSF.TF.C.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle.
HSF.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.*

Unit 9: Statistics
Priority Standards:
HSS.ID.A.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
Supporting Standards:
HSS.IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
HSS.IC.A.2 Decide if a specified model is consistent with 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?
HSS.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
HSS.IC.B.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.
HSS.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
HSS.IC.B.6 Evaluate reports based on data.