Marietta City Schools

2024–2025 District Unit Planner

Enhanced Advanced Algebra and AP Precalculus

Unit title	Unit 2: Modeling Polynomial and Piecewise Functions (DOE Units 3 and 4)	**Unit duration (hours)**	15 - 20 hours

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

GA DoE Standards

Standards

AP PC 1.1 - 1.6

1.1 Changes in Tandem
1.2 Rates of Change
1.3 Rates of Change in Linear and Quadratic Functions
1.4 Polynomial Functions and Rates of Change
1.5 Polynomial Functions and Complex Zeros
1.6 Polynomial Functions and End Behavior

AA.FGR.5: Extend exploration of quadratic solutions to include real and non-real numbers and explore how these numbers behave under familiar operations and within real-world situations; create polynomial expressions, solve polynomial equations, graph polynomial functions, and model real-world phenomena.

AA.FGR.5.1 Graph and analyze quadratic functions in contextual situations and include analysis of data sets with regressions.

AA.FGR.5.2 Define complex numbers i such that $i^2 = -1$ and show that every complex number has the form a + bi where a and b are real numbers and that the complex conjugate is a - bi.

AA.FGR.5.3 Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

AA.FGR.5.4 Use the structure of an expression to factor quadratics.

AA.FGR.5.5 Write and solve quadratic equations and inequalities with real coefficients and use the solution to explain a mathematical, applicable situation.

AA.FGR.5.6 Solve systems of quadratic and linear functions to determine points of intersection.

AA.FGR.5.7 Create and analyze quadratic equations to represent relationships between quantities as a model for contextual situations.

AA.FGR.5.8 Identify the number of zeros that exist for any polynomial based upon the greatest degree of the polynomial and the end behavior of the polynomial by observing the sign of the leading coefficient.

AA.FGR.5.9 Identify zeros of polynomial functions using technology or pre-factored polynomials and use the zeros to construct a graph of the function defined by the polynomial function. Analyze identify key features of these polynomial functions.

AA.FGR.5.10 Use the structure of an expression to factor polynomials, including the sum of cubes, the difference of cubes, and higher-order polynomials that may be expressed as a quadratic within a quadratic.

AA.FGR.5.11 Using all the zeros of a polynomial function, list all the factors and multiply to write a multiple of the polynomial function in standard form.

PC.FGR.2: Analyze the behaviors of rational and piecewise functions to model contextual mathematical problems.

PC.FGR.2.1 Graph piecewise-defined functions, including step functions and absolute value functions.

PC.FGR.2.2 Describe characteristics by interpreting the algebraic form and graph of a piecewise-defined function.

PC.FGR.2.3 Represent the limit of a function using both the informal definition and the graphical interpretation in the context of piecewise-defined functions; interpret limits expressed in analytic notation.

PC.FGR.2.4 Divide polynomials using various methods.

Concepts/Skills to be Mastered by Students

1.A Solve equations and inequalities represented analytically, with and without technology.
1.B Express functions, equations, or expressions in analytically equivalent forms that are useful in a given mathematical or applied context.
1.C Construct new functions, using transformations, compositions, inverses, or regressions, that may be useful in modeling contexts, criteria, or data, with and without technology.
2.A Identify information from graphical, numerical, analytical, and verbal representations to answer a question or construct a model, with and without technology.
2.B Construct equivalent graphical, numerical, analytical, and verbal representations of functions that are useful in a given mathematical or applied context, with and without technology.
3.A Describe the characteristics of a function with varying levels of precision, depending on the function representation and available mathematical tools.
3.B Apply numerical results in a given mathematical or applied context.
3.C Support conclusions or choices with a logical rationale or appropriate data.

Vocabulary

Axis	Coefficient	Complex Number	Concave Down	Concave Up	Decreasing
Degree	End Behavior	Exponent	Extrema	Factor	Features
Fundamental Theorem of Algebra	Higher Order Polynomials	i (the number “i”)	Imaginary Number	Increasing	Intersection Point
Leading Coefficient	Limit	Maximum	Minimum	Multiple	Quadrant
Quartic	Polynomial	Root	Real Number	Regression	Zero

Notation

i

$y = ax^2 + bx + c, \quad y = a(x - h)^2 + k, \quad y = a(x - p)(x - q)$

$y = ax^n + bx^{n-1} + cx^{n-2} + \ldots + dx + k$

$\lim_{x \to \infty} p(x) = \infty$ OR $\lim_{x \to \infty} p(x) = -\infty$

Essential Questions

- How do we model the intensity of light from its source?
- How can I use data and graphs to figure out the best time to purchase event tickets?
- How can we adjust known projectile motion models to account for changes in conditions?
- What are polynomial functions and how are they different from other types of functions?
- How do we identify the degree and leading coefficient of a polynomial function?
- What are the different forms of polynomial functions and how are they interconnected?
- How do we use polynomial functions to model real-world situations or problems?
- What role do the roots, zeros, and factors play in understanding polynomial functions?
- How do we analyze and interpret the behavior of polynomial functions, including end behavior and turning points?
- What strategies and techniques can be employed to graph polynomial functions accurately?
- How do we apply transformations to basic polynomial functions to create more complex ones?
- What methods exist for solving polynomial equations, and how do we determine their solutions?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s): Unit Quiz

Summative Assessment(s): Unit Test

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
		All information included by PLC in the differentiation box is the responsibility and

		ownership of the local school to review and approve per Board Policy IKB.
AA.FGR.5 ● **AA.FGR.5.1 Graph and analyze quadratic functions in contextual situations and include analysis of data sets with regressions.** ● **AA.FGR.5.5 Write and solve quadratic equations and inequalities with real coefficients and use the solution to explain a contextual situation.** ● **AA.FGR.5.7 Create and analyze quadratic equations to represent relationships between quantities as a model for contextual situations**	Link to Learning Experience: Welcome-Back-Poly-Student-Reproducibles-Enhanced-AA-AP-Prec (gadoe.org) Within the Big Idea of Functional and Graphical Reasoning, in this learning plan, students will: ● Create polynomial expressions, ● Classify polynomial expressions, and ● Write and solve polynomial equations. Learning Goals ● I can classify polynomials by degree. ● I can solve polynomial equations.	Students will be grouped together to work through the learning experience. The first page will be used to activate prior knowledge and determine which groups will need additional scaffolding. Extension will be provided by including AP topics such as rate of change.

Content Resources

Math Medic

AP Classroom

Bryan Passwater Notes

Textbook Correlation: enVision A|G|A - Algebra 2

AA.FGR.5.1 - Lessons 2-1, 2-2, 3-3, 3-6
AA.FGR.5.2 - Lesson 2-4
AA.FGR.5.3 - Lessons 2-4
AA.FGR.5.4 - Lessons 2-3, 2-4
AA.FGR.5.5 - Lesson 1-5, 2-3, 2-4, 2-5, 2-6, Topic 2-Mathematical Modeling in 3 Acts
AA.FGR.5.6 - Lessons 2-7
AA.FGR.5.7 - Lessons 2-1, 2-2, Topic 2-Mathematical Modeling in 3 Acts
AA.FGR.5.8 - Lessons 3-5, 3-6, Topic 3-Mathematical Modeling in 3 Acts
AA.FGR.5.9 - Lessons 3-1, 3-5, Topic 3-Mathematical Modeling in 3 Acts
AA.FGR.5.10 - Lesson 3-3
AA.FGR.5.11 - Lesson 3-6