Marietta City Schools

2024–2025 District Unit Planner

Enhanced Advanced Algebra & AP Precalculus

Unit title	Unit 4: Modeling with Radical, Exponential, and Logarithmic Functions and Series (DOE Unit 2 and 8)	**Unit duration (hours)**	*23 - 26 hours*

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

GA DoE Standards

Standards

AA.FGR.3 Explore and analyze structures and patterns for exponential and logarithmic functions and use exponential and logarithmic expressions, equations, and functions to model real-life phenomena.

AA.FGR.3.1 Find the inverse of exponential and logarithmic functions using equations, tables, and graphs, limiting the domain of inverses where necessary to maintain functionality, and prove by composition or verify by inspection that one function is the inverse of another.
AA.FGR.3.2 Analyze, graph, and compare exponential and logarithmic functions.
AA.FGR.3.3 Use the definition of a logarithm, logarithmic properties, and the inverse relationship between exponential and logarithmic functions to solve problems in context.
AA.FGR.3.4 Create exponential equations and use logarithms to solve mathematical, applicable problems for which only one variable is unknown.
AA.FGR.3.5 Create and interpret logarithmic equations in one variable and use them to solve problems.
AA.FGR.3.6 Create, interpret, and solve exponential equations to represent relationships between quantities and analyze the relationships numerically with tables, algebraically, and graphically.
AA.FGR.3.7 Create, interpret, and solve logarithmic equations in two or more variables to represent relationships between quantities.

AA.FGR.4: Explore and analyze structures and patterns for radical functions and use radical expressions, equations, and functions to model real-life phenomena.

AA.FGR.4.1 Rewrite radical expressions as expressions with rational exponents. Extend the properties of integer exponents to rational exponents.
AA.FGR.4.2 Solve radical equations in one variable, and give examples showing how extraneous solutions may arise.
AA.FGR.4.3 Analyze and graph radical functions.
AA.FGR.4.4 Create, interpret and solve radical equations with one unknown value and use them to solve problems that model real-world situations.
AA.FGR.4.5 Create, interpret, and solve radical equations in two or more variables to represent relationships between quantities.

PC.PAR.7 Demonstrate how sequences and series apply to mathematical models in real-life situations.

PC.PAR.7.1 Demonstrate that sequences are functions whose domain is the set of natural numbers.
PC.PAR.7.2 Represent sequences graphically, numerically, and symbolically.

PC.PAR.7.3 Determine the limit of a sequence if it exists.
PC.PAR.7.4 Demonstrate that a series is the sum of the sequence and represent series graphically, numerically, and symbolically.
PC.PAR.7.5 Describe the behavior of a series in terms of the limit of its partial sums
PC.PAR.7.6 Derive and use the sum formula of a finite geometric series to solve contextual problems to model real-life situations.
PC.PAR.7.7 Derive and use the sum formula of an infinite geometric series to solve contextual problems to model real-life situations.

AA.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.
AA.MM.1.1 Explain applicable, mathematical problems using a mathematical model.
AA.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
AA.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a mathematical, applicable situation.
AA.MM.1.4 Use various mathematical representations and structures to represent and solve real-life problems.

College Board Standards

2.1 Change in Arithmetic and Geometric Sequences
2.2 Change in Linear and Exponential Functions
2.3 Exponential Functions
2.4 Exponential Function Manipulation
2.5 Exponential Function Context and Data Modeling
2.6 Competing Function Model Validation
2.7 Composition of Functions
2.8 Inverse Functions
2.9 Logarithmic Expressions
2.10 Inverses of Exponential Functions
2.11 Logarithmic Functions
2.12 Logarithmic Function Manipulation
2.13 Exponential and Logarithmic Equations and Inequalities
2.14 Logarithmic Function Context and Data Modeling
2.15 Semi-log Plots

Concepts/Skills to be Mastered by Students

-Inverses
-Graphing Log/Exponential Functions: Characteristics and Transformations
-Create, interpret and solve exp/log (one and two variables).
-Tables of exp/log
- Properties of Logs
-Real world application

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

Arithmetic sequences, Geometric sequences, Exponential Growth, Exponential Decay, Residual Plot, Additive and multiplicative transformations, Common Logarithm, Natural Logarithm.

Notation

Natural log: ln Common log: log Log base (argument) = exp

$\lim_{x \to \pm\infty} ab^x = -\infty$, or $\lim_{x \to \pm\infty} ab^x = 0.$ $f \circ g$ f^{-1},

Essential Questions

What is the inverse of a logarithmic function?

What is the inverse of an exponential function?

What are the characteristics of an exponential graph?

What are the characteristics of a logarithmic graph?

Which logarithmic properties are used to solve logarithmic equations?

How is exponential growth/decay represented on a graph? In context?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

Unit Quizzes

Summative Assessment(s):

Unit 4 Part A Test

Unit 4 Part B Test

tests will possibly be split over the semester mark

Learning Experiences Add additional rows below as needed.		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
AA.FGR.3 Explore and analyze structures and patterns for exponential and logarithmic functions and use exponential and logarithmic expressions, equations, and functions to model real-life phenomena. ● **AA.FGR.3.1** Find the inverse exponential and logarithmic functions using equations, tables, and graphs, limiting the domain of inverses where necessary to maintain functionality, and prove by composition or verify by inspection that one function is the inverse of another.	DOE Task: Composition of Functions Composition-of-Functions-Student-Reproducibles-AA-Unit-2 In this learning plan, students will calculate inverse operations, identify one-to-one functions, find inverse functions symbolically, and use other representations to find inverse functions. Learning Goals: ● I can calculate the composition of functions numerically. ● I can calculate the composition of functions graphically. ● I can calculate the composition of functions symbolically. ● I can verify two functions are inverses by function composition.	Students will be able to work at their own pace in collaborative groups where additional scaffolding is available as needed.
Content Resources		

Math Medic

AP Classroom

Bryan Passwater Notes

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

AA.FGR.3.1 - Lessons 6-4
AA.FGR.3.2 - Lessons 6-1, 6-4
AA.FGR.3.3 - Lessons 6-3
AA.FGR.3.4 - Lesson 6-3, 6-6
AA.FGR.3.5 - Lesson 6-5
AA.FGR.3.6 - Lessons 6-1, 6-2, Topic 6-Mathematical Modeling in 3 Acts
AA.FGR.3.7 - Lesson 6-4

AA.FGR.4.1 - Lessons 5-1, 5-2
AA.FGR.4.2 - Lesson 5-1
AA.FGR.4.3 - Lessons 5-3, 5-4
AA.FGR.4.4 - Lessons 5-4, Topic 5-Mathematical Modeling in 3 Acts
AA.FGR.4.5 - Lessons 5-4, Topic 5-Mathematical Modeling in 3 Acts