Unit #1 Polynomial and Rational Functions

Content Area: **Mathematics**
Course(s): **Honors Pre-Calculus**
Time Period: **September**
Length: **2 weeks**
Status: **Published**

Unit Overview

Students will use various methods to locate zeros of polynomial functions, they will examine the relationship of locating zeros to solving for roots of an equation. the strand of modeling real-world data is extended to include polynomial functions

Enduring Understandings

- By using various representations students will be better able to comunicate their thinking and solve problems
- Patterns, functions and relationships can be represented graphically, numerically, symbolically and verbally

Essential Questions

- How are patterns of change related to the behavior of functions?
- How can patterns, relations and functions be used as tools to best describe and help explain real-life situations?

Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.F-IF.C	Analyze functions using different representations
MA.F-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.

Indicators

MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.F-IF.C.7c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
MA.F-IF.C.7d	Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

Student Learning Objectives

- SWBAT determine roots of polynomial equations
- SWBAT determine the number of positive and negative real roots
- SWBAT factor quadratics using quadratic formula and completing the square
- SWBAT find the factors of polynomials using the remainder theorem.
- SWBAT identify all possible rational roots of a polynomial equation by applying the rational root theorem
- SWBAT solve quadratic equations and use the discriminant to describe the roots of the equation
- SWBAT solve radical equations and inequalities

Lesson Titles

- Polynomial Functions
- Quadratic Functions
- The Rational Root Theorem
- The Remainder and Factor Theorems

21st Century Skills and Career Ready Practices

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.

Inter-Disciplinary Connections

LA.RL.11-12.9	Demonstrate knowledge of and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) eighteenth-, nineteenth- and early twentieth-century foundational works of literature, including how two or more texts from the same period treat similar themes or topics.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.WHST.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented.
LA.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
9-12.HS-ETS1-4.5	Using Mathematics and Computational Thinking
9-12.HS-ETS1-4.5.1	Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems.

Instructional Strategies/Learning Activities/Levels of Bloom/DOK

- Assessment
- Go over study guide solutions
- Group students in fours
- review homework
- to determine the number of positive and negative rational roots, demonstrate use of descartes rule of signs, work through selected examples, do them on board.
- to find the factors of polynomials, explain the remainder theorem, also review synthetic division, show relationship to these methods when finding roots.
- to identify all possible rational roots of a polynomial equation, review synthetic division and simple factoring, demonstrate how to apply the rational root theorem, start worksheet, groupwork allowed.
- to identify possible rational roots, review synthetic division, explain rational root theorem, have students list them to dtermine the rational roots.
- to solve quadratic equations, review factoring and complete the square techniques, list quadratic formula on board and work through selected examples, check by calculator, do examples for each method.
- to solve radical equations, discuss extraneous solutions, work through several examples, review how to simplify radicals and solve the equation.
- tutoring during Delsea One

Modifications

ELL Modifications

- Assess ELL students continuously using formative assessment methods
- Be flexible with time frames and deadlines
- During Delsea One - one on one with a student who speaks the same language
- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Khan academy offers lessons in several languages
- Offer resources for specific topics in primary language
- Use google translator, especially for application problems
- Using techonology, such as but not limited to: graphing calculator and desmos

IEP & 504 Modifications

- allowing co-teaching with general education and special education teachers in the same classroom so that the special education teacher can re-teach students with special needs in a different way (smaller group)
- for assessments - allowing students to correct mistakes or answer wrong questions correctly for additional credit if failed the first test

- for assessments - rewording questions so that there are not higher level vocabulary within the question (you are testing for understanding of the content not the ability to understand the question)
- if not in a co-teaching setting allowing time in the schedule for a special education teacher to consult with general education teachers on what specifically can be modified or how to paraphrase things in a different way specific to that lesson
- math tests could have formula's available on the test and/or sample problems
- Modeling and showing lots of examples
- Non-verbal redirection behaviors
- students could use calculator and/or other math tools (x grids, chips, ect)
- teaching the main ideas/concepts (limiting not needed details)to be taught and repeating them in several different ways over several different days
- tutoring during Delsea One
- Working with Special Education teacher who is placed in the classroom for assistance

G & T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- Avoid drill and practice activities.
- Effective questioning techniques (focus on what's important, provide processing time, require higher order thinking
- Encourage students to explore concepts in depth and encourage independent studies or investigations.
- provide additional rigorous challenge problems for advanced students
- Refrain from having them complete more work in the same manner.

At Risk Modifications

- additional help during tutoring/Delsea One/Academic Enrichment
- guided notes
- modeling and showing lots of examples
- more resources/supports
- study guides

Benchmark Assessments

Skills-based assessment - math practice

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Formative Assessment

- anticipatory set
- closure
- homework
- participation
- partner/group activity
- pop quizes
- Quiz on Solving Quadratics
- student boardwork
- Teacher observation
- warm up

Summative Assessment

- Benchmark Assessment
- Marking Period Assessment
- Midchapter Test on Polynomial and Rational Functions

Resources & Materials

- Advanced Mathematical Concepts Precalculus with Applications textbook
- Cooperative learning explorations
- Evoke student participation from their seats and at the board
- google classroom
- Mathpower4u math videos
- PowerPoint Lessons
- Teacher generated worksheets
- Youtube videos to introduce/demonstrate concepts in real-life situations

Technology

- Chromebook
- Desmos graphing calculator
- Equatio
- Graphing Calculators
- Quizizz

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.